Configuring ATM Services

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Site Manager Software Version 5.0

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Bay Networks

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About This Guide

This guide describes Asynchronous Transfer Mode (ATM) and what you do to start and customize a Bay Networks ATM router. Use the following table to locate the subject in this guide that you want to know more about.

Subject	Go to
Starting ATM on your router	Chapter 1
General ATM information and an example of an ATM network using Bay Networks equipment	Chapter 2
General Classical IP Over ATM information	Chapter 3
General LAN Emulation information	Chapter 4
Customizing an ATM line	Chapter 5
Customizing an ATM interface	Chapter 6
Customizing an ATM service record	Chapter 6
Customizing PVCs	Chapter 7
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Customizing SAAL	Chapter 12
Accessing Site Manager Parameters	Appendix A
Getting a complete list of Site Manager Parameters	Appendix A
Getting a complete list of Site Manager Defaults	Appendix B
Viewing a sample ATM log file	Appendix C

Before You Begin

Before using this guide, you must complete the following procedures. For a new router:

- Install the router (refer to the installation manual that came with your router).
- Connect the router to the network and create a pilot configuration file (refer to *Quick-Starting Routers and BNX Platforms*, *Connecting BayStack AN and ANH Systems to a Network*, or *Connecting ASN Routers and BNX Platforms to a Network)*.

Make sure that you are running the latest version of Bay Networks Site Manager and router software. For instructions, refer to *Upgrading Routers from Version 7–10.xx to Version 11.0*.

Conventions

angle brackets (< >)	Indicate that you choose the text to enter based on the description inside the brackets. Do not type the brackets when entering the command. Example: if command syntax is **ping** *<ip_address>*, you enter **ping 192.32.10.12**
bold text	Indicates text that you need to enter, command names, and buttons in menu paths. Example: Enter **wfsm &**
	Example: Use the **dinfo** command.
	Example: ATM DXI > Interfaces > **PVCs** identifies the PVCs button in the window that appears when you select the Interfaces option from the ATM DXI menu.
brackets ([ ])	Indicate optional elements. You can choose none, one, or all of the options.
ellipsis points	Horizontal (. . .) and vertical (⋮) ellipsis points indicate omitted information.
italic text	Indicates variable values in command syntax descriptions, new terms, file and directory names, and book titles.
quotation marks (“ ”)	Indicate the title of a chapter or section within a book.

`screen text`	Indicates data that appears on the screen. Example: `Set Bay Networks Trap Monitor Filters`
separator (>)	Separates menu and option names in instructions and internal pin-to-pin wire connections. Example: Protocols > AppleTalk identifies the AppleTalk option in the Protocols menu. Example: Pin 7 > 19 > 20
vertical line (|)	Indicates that you enter only one of the parts of the command. The vertical line separates choices. Do not type the vertical line when entering the command. Example: If the command syntax is **show at routes** | **nets**, you enter either **show at routes** or **show at nets**, but not both.

Acronyms

AAL	ATM adaptation layer
ABR	available bit rate
AFI	authority and format identifier
ALC	Adaptation Layer Controller
ARE	ATM Routing Engine
ARP	Address Resolution Protocol
ATM	Asynchronous Transfer Mode
BFE	Blacker front-end encryption
B-ISDN	Broadband Integrated Services Digital Network
BUS	broadcast and unknown server
CMS	Connection Management System
CPCS	common part convergence sublayer
CS	convergence sublayer
CSU	channel service unit
DCE	data communications equipment
DDN	Defense Data Network
DSU	data service unit
DTE	data terminal equipment

DXI	Data Exchange Interface
ELAN	emulated LAN
ER	error recovery
FRE	Fast Routing Engine
ILI	Intelligent Link Interface
ILMI	Interim Local Management Interface
IP	Internet Protocol
IPX	Internet Packet Exchange
ITU-T	International Telecommunications Union – Telecommunication Standardization Sector
LANE	LAN emulation
LE	LAN emulation
LEC	LAN emulation client
LECS	LAN emulation configuration server
LES	LAN emulation server
LIS	logical IP subnet
LLC	Logical Link Control
LUNI	LAN emulation UNI
MAC	media access control
MBS	maximum burst size
MCS	multicast server
MIB	management information base
MCR	minimum cell rate
MTU	Maximum Transmission Unit
NML	Native Mode LAN
NMS	network management station
NNI	network-to-network interface
OAM&P	operations, administration, maintenance and provisioning
OSI	Open Systems Interconnection
OSPF	Open Shortest Path First
PCR	peak cell rate
PD	poll data
PDN	Public Data Network

PDU	protocol data unit
PVC	permanent virtual circuit
RIP	Routing Information Protocol
RS	resynchronization
SAAL	Signaling AAL
SAP	service access point
SAR	segmentation and reassembly
SCR	sustainable cell rate
SD	sequenced data
SDH	Synchronous Digital Hierarchy
SDU	service data unit
SMDS	Switched Multimegabit Data Services
SNAP	Subnetwork Access Protocol
SNMP	Simple Network Management Protocol
SONET	Synchronous Optical Network
SPE	synchronous payload envelope
SRM	system resource module
SSCOP	Service Specific Connection Oriented Protocol
SSCS	Service Specific Convergence Sublayer
STAT	status
STP	shielded twisted pair
SVC	switched virtual circuit
TOH	transport overhead
UNI	user-network interface
UTP	unshielded twisted pair
VBR	variable bit rate
VC	virtual circuit
VCC	virtual channel connection
VCI	virtual channel identifier
VCL	virtual channel link
VPC	virtual path connection
VPI	virtual path identifier
WAN	wide area network

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The message section is monitored by Bay Networks engineers, who provide assistance wherever possible. Customers and resellers holding Bay Networks service contracts also have access to special libraries for advanced levels of support documentation and software. To take advantage of CompuServe's recently enhanced menu options, the Bay Networks Forum has been re-engineered to allow links to our Web sites and FTP sites.

We recommend the use of CompuServe Information Manager software to access these Bay Networks Information Services resources. To open an account and receive a local dial-up number in the United States, call CompuServe at 1-800-524-3388. Outside the United States, call 1-614-529-1349, or your nearest CompuServe office. Ask for Representative No. 591. When you are on line with your CompuServe account, you can reach us with the command **GO BAYNET**.

InfoFACTS

InfoFACTS is the Bay Networks free 24-hour fax-on-demand service. This automated system has libraries of technical and product documents designed to help you manage and troubleshoot your Bay Networks products. The system responds to a fax from the caller or to a third party within minutes of being accessed.

To use InfoFACTS in the United States or Canada, call toll-free 1-800-786-3228. Outside North America, toll calls can be made to 1-408-764-1002. In Europe, toll-free numbers are also available for contacting both InfoFACTS and CompuServe. Please check our Web page for the listing in your country.

How to Get Help

Use the following numbers to reach your Bay Networks Technical Response Center:

Technical Response Center	Telephone Number	Fax Number
Billerica, MA	1-800-2LANWAN	(508) 670-8765
Santa Clara, CA	1-800-2LANWAN	(408) 764-1188
Valbonne, France	(33) 92-968-968	(33) 92-966-998
Sydney, Australia	(612) 9927-8800	(612) 9927-8811
Tokyo, Japan	(81) 3-5402-0180	(81) 3-5402-0173

Chapter 1
Starting ATM

This chapter provides instructions for setting up an ATM interface to run the default PVC, Classical IP, or LANE configuration.

Before You Begin

Before you can start ATM on your router, you must

1. Open a configuration file.
2. Specify router hardware (if using a local-mode configuration file).
3. Select the link module interface on which you are enabling ATM.

If you have questions about how to perform any of these preliminary tasks, refer to *Configuring Routers*.

The Technician Interface allows you to modify parameters by issuing **set** and **commit** commands with the management information base (MIB) object ID. This process is equivalent to modifying parameters using Site Manager.

For more information about using the Technician Interface to access the MIB, refer to *Using Technician Interface Software*.

Caution: We strongly recommend that you use the Technician Interface for very minor MIB adjustments only. The Technician Interface does not validate parameter entries. Entering an invalid value can corrupt your configuration.

Adding ATM to the Router

Adding ATM to the router means:

1. Creating an ATM circuit
2. Defining an ATM service record
3. Enabling protocols on an ATM service record
4. Adding at least one virtual circuit (PVCs only) to that service record

Creating an ATM Circuit

To create an ATM circuit on an interface:

1. **Click on an ATM link module interface (labeled ATM1) in the Configuration Manager window.**

   The Add Circuit window opens.

2. **Click on OK.**

   The Initial ATM Signaling Config window opens.

3. **Click on OK to accept the default settings or edit the parameters.**

   Refer to Appendix A for a detailed description of any parameter you may want to customize.

4. **Click on OK.**

   The Edit ATM Connector window opens.

5. **Go to the next section to define a service record on the circuit.**

Defining a Service Record

The Configuration Manager allows you to add service records for a specific data encapsulation type. Depending on the data encapsulation type you choose, the Configuration Manager also allows you to select a permanent virtual circuit (PVC) or switched virtual circuit (SVC) connection type for that service record.

Caution: You cannot edit the Data Encapsulation Type or Virtual Connection Type parameters once you assign them to a service record. However, you can edit the Data Encapsulation Type for individual PVCs.

Table 1-1 identifies which data encapsulation types you can apply to permanent and switched virtual circuits.

Table 1-1. Valid Data Encapsulation Types for PVCs and SVCs

Data Encapsulation Type	Permanent Virtual Circuit	Switched Virtual Circuit
LANE		✔
LLC/SNAP	✔	✔
NLPID	✔	✔
NULL	✔	✔

Note: For an explanation of the different data encapsulation types, and rules for assigning data encapsulation, refer to Chapter 2.

Adding a Service Record for PVCs

To add a service record for permanent virtual circuits:

1. **Click on Service Attributes in the Edit ATM Connector window.**

   The ATM Service Records List window opens.

2. **Click on Add.**

   The ATM Service Record Parameters window opens.

Note: If you disabled signaling in the Initial ATM Signaling Config window, the ATM Service Record Parameters window automatically changes the default for the Data Encapsulation Type parameter to Logical Link Control/ Subnetwork Access Protocol (LLC/SNAP) and the Virtual Connection Type parameter to PVC.

3. **Change the Data Encapsulation Type parameter from LANE (the default) to LLC/SNAP, NLPID, or NULL.**

Note: For an explanation of the different data encapsulation types, and rules for assigning data encapsulation, refer to Chapter 2.

4. **Change the Virtual Connection Type parameter from SVC to PVC.**

Note: You must press the return key or tab key to advance to the Virtual Connection Type parameter. Pressing either key acknowledges the data encapsulation type selection. If you neglect this step, the Configuration Manager does not provide PVC as an option for the Virtual Connection Type parameter.

Refer to Appendix A for a detailed description of any parameter you may want to customize.

5. **Click on OK.**

   The Select Protocols window opens.

6. **Go to "Enabling Protocols on an ATM Service Record," later in this chapter.**

Adding a Service Record for Classical IP

To add a service record for Classical IP:

1. **Click on Service Attributes in the Edit ATM Connector window.**

   The ATM Service Records List window opens.

2. **Click on Add.**

   The ATM Service Record Parameters window opens.

3. **Change the Data Encapsulation Type parameter from LANE (the default) to LLC/SNAP or NULL.**

   Refer to Appendix A for a detailed description of any parameter you may want to customize.

Note: If you do not enter an ATM address user part, the Configuration Manager uses the media access control (MAC) address of the interface (or the MAC address override from the ATM Interface Attributes window) as the first six bytes of the address. The Configuration Manager then adds a selector byte, unique to this service record, to complete the address.

4. **Click on OK.**

   The Select Protocols window opens.

5. **Go to "Enabling Protocols on an ATM Service Record," later in this chapter.**

Adding a Service Record for LANE

To add a service record for LANE:

1. **Click on Service Attributes in the Edit ATM Connector window.**

   The ATM Service Records List window opens.

2. **Click on Add.**

   The ATM Service Record Parameters window opens.

   Refer to Appendix A for a detailed description of any parameter you may want to customize.

Note: If you do not enter an ATM address user part, the Configuration Manager uses the MAC address of the interface (or the MAC address override from the ATM Interface Attributes window) as the first six bytes of the address. The Configuration Manager then adds a selector byte, unique to this service record, to complete the address.

3. **Click on OK.**

   The Select Protocols window opens.

4. **Go to the next section.**

Enabling Protocols on an ATM Service Record

Depending on the data encapsulation type and virtual connection type (PVC or SVC) you choose for the service record, the router supports various protocols.

Supported Protocols

Table 1-2 lists all supported protocols for standard PVCs and SVCs using LLC/SNAP, NLPID, NULL, or LANE 802.3 data encapsulation.

Table 1-2. Supported Protocols

PVC Using LLC/SNAP, NLPID, or NULL	SVC Using LLC/SNAP or NULL (RFC 1577)	SVC Using LANE 802.3
Bridge	IP	Bridge
Spanning Tree	RIP	Spanning Tree
Native Mode LAN	BGP	Native Mode LAN
IP	OSPF	IP
RIP		RIP
EGP		BGP
BGP		OSPF
OSPF		DECnet IV
BOOTP		IPX
IGMP		RIP/SAP
DVMRP		AppleTalk
NetBIOS		LLC2
DECnet IV		DLSw
IPX		
RIP/SAP		
XNS		
RIP (XNS)		
AppleTalk		

Things to Remember

When enabling protocols on a service record, keep the following in mind:

- A PVC service record requires that you add at least one PVC for the service record to operate.
- Each ATM service record globally controls
  - -- All protocols for any standard PVCs and SVCs that it contains
  - -- All nonbridging protocols for any hybrid PVCs that it contains
- When you select either NULL or LLC/SNAP data encapsulation to run on an SVC, you automatically select the technology defined in RFC 1577, *Classical IP and ARP over ATM*. This technology allows you to set up logical IP subnets within your ATM network and provides the ability to use an address resolution protocol to obtain information, and receive that information from a designated ATMARP server. For additional information about RFC 1577 and how to configure logical IP subnets on an ATM network, refer to Chapter 3.
- After you add protocols to an LLC/SNAP, NULL, or LANE switched virtual circuit, Site Manager adds an SVC button to the ATM Service Records List window. Clicking on the SVC button opens the SVC window. From this window, you can view and delete individual SVCs from the service record (dynamic mode only).
- Selecting LANE to run on an SVC service record defines that service record as belonging to an emulated LAN. This means that any protocols on that service record operate as if they were running over a traditional Ethernet LAN.
- After you add protocols to a LANE switched virtual circuit, Site Manager adds a LEC (LAN emulation client) button to the ATM Service Records List window. Clicking on the LEC button opens the ARE LAN Emulation Parameters window. For additional information about customizing LAN emulation clients, refer to Chapter 8.

Selecting Protocols

To select protocols to operate on a service record:

1. **Click on the protocol or protocols you want to enable in the Select Protocols window.**
2. **Click on OK.**

   For each protocol you select, the Configuration Manager displays a protocol-specific window prompting you for required information. If you need assistance in responding to any queries, consult the appropriate protocol-specific guide.

   When you finish configuring the protocols, the ATM Virtual Channel Link window opens.

Note: If you are adding protocols to a PVC service record, you must add at least one PVC for that service record to operate.

Adding PVCs

To add a PVC to a PVC service record:

1. **Click on Add in the ATM Virtual Channel Link window.**

   The ATM Virtual Channel Link Parameters window opens.

2. **Supply the following information:**

   - *A VPI (virtual path identifier) number.* This number identifies the virtual path of the PVC. The VPI is part of the cell header. The header can contain a maximum of 8 VPI bits for a UNI connection. This bit range allows for path identifiers from 0 through 255.

Site Manager: VPI Number: page A-25

   - *A VCI (virtual channel identifier) number.* This number identifies the virtual channel of the PVC. The VCI is part of the cell header. The header can contain a maximum of 16 VCI bits. This bit range allows for channel identifiers from 0 through 65535.

Site Manager: VCI Number: page A-26

Note: Following the recommendation of the ATM Forum, virtual channel identifiers from 0 through 31 are reserved for signaling and added functionality.

3. **Click on OK.**

   The Configuration Manager returns you to the ATM Virtual Channel Link window. If you want to change any of the parameters in the ATM Virtual Channel Link window, refer to Appendix A for parameter information.

4. **If you want to add another PVC with the default configuration, repeat Steps 1 through 3.**

5. **Click on Done.**

   The Configuration Manager returns you to the ATM Service Records List window.

Where to Go Next

Use the following table to determine where you want to go next.

For information about	Go to
General ATM information	Chapter 2
General Classical IP over ATM information	Chapter 3
General LAN emulation information	Chapter 4
Customizing an ATM line	Chapter 5
Customizing an ATM interface or service record	Chapter 6
Customizing PVCs	Chapter 7
Customizing a LAN emulation client	Chapter 8
Customizing signaling	Chapter 9
Customizing ILMI	Chapter 10
Customizing signaling and ILMI control VCs	Chapter 11
Customizing SAAL	Chapter 12
Accessing Site Manager parameters	Appendix A
Site Manager defaults	Appendix B
ATM log files	Appendix C

Chapter 2
Understanding ATM Concepts

This chapter looks at concepts underlying ATM and, where appropriate, the specific ways we implement these concepts on our routers.

ATM General Information

Asynchronous Transfer Mode (ATM) is a connection-oriented, cell-based technology that relays traffic across a Broadband Integrated Services Digital Network (B-ISDN). It is a cost-effective way of transmitting voice, video, and data across a network.

ATM Cells

An ATM cell is a short, fixed-length packet of 53 bytes. It consists of a 5-byte header containing address information and a fixed, 48-byte information field. Figure 2-1 shows a diagram of an ATM cell.

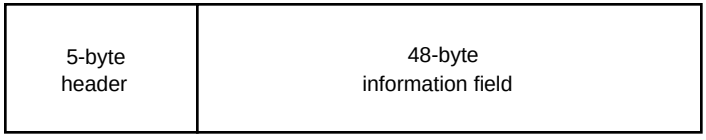


Figure 2-1. ATM Cell

Using a fixed-length cell size allows you to predict network delays, making ATM suitable for carrying real-time information (for example, voice and video) as well as data.

ATM allows the network to operate at a much higher rate than typical packet-switching systems (for example, X.25), because it provides no error protection or flow control. Instead, ATM relies on the source and destination devices to perform error-recovery functions such as retransmission of lost packets.

Cell Headers

After dividing the data into 48-byte segments for transmission, the end device (that is, the ATM DSU/CSU or native ATM device) attaches the required header information (Figure 2-2).

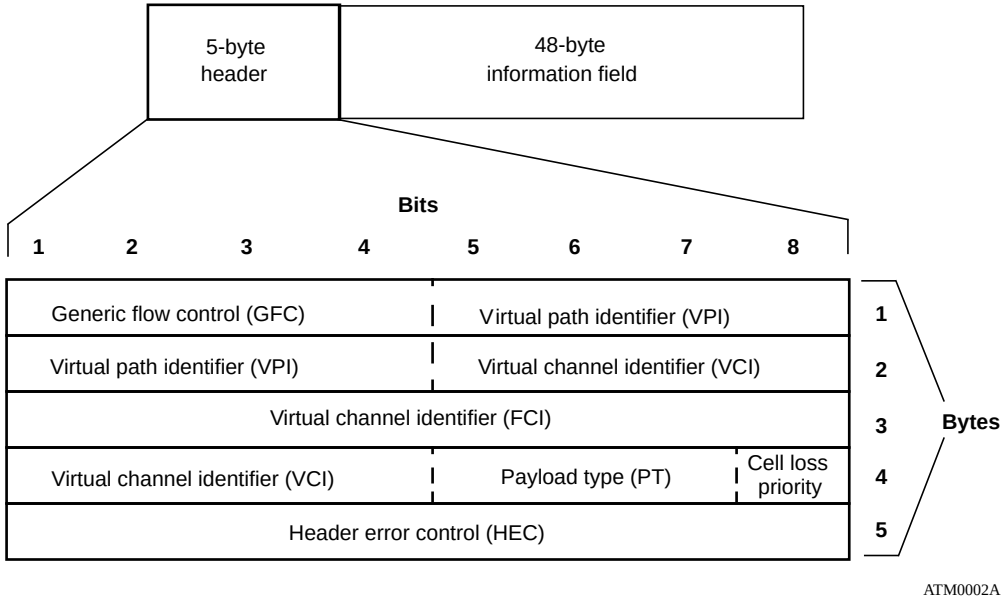


Figure 2-2. ATM Cell Header

The fields in each ATM cell header provide all the information necessary for networking. These fields include the following:

- **Generic Flow Control (GFC)**: The first 4 bits of the cell header contain the GFC. The GFC controls traffic flow onto the ATM network by controlling the user-network interface (UNI).

- **Virtual Path Identifier (VPI)**: The next 8 bits of the cell header (that is, the last half of byte 1 and the first half of byte 2) contain the VPI. The VPI specifies a virtual path on the physical ATM link. Refer to the next section, “Data Transmission,” for additional information on virtual paths.
- **Virtual Channel Identifier (VCI)**: The next 16 bits of the cell header (that is, the last half of byte 2, all of byte 3, and the first half of byte 4) contain the VCI. The VCI specifies a virtual channel within the virtual path on the physical ATM link. Refer to the next section, “Data Transmission,” for additional information on virtual channels.
- **Payload Type (PT)**: The next 3 bits (that is, bits 5 through 7 of byte 4) indicate the type of information the cell is carrying (for example, user data or management information).
- **Cell Loss Priority (CLP)**: The last bit of byte 4 indicates the priority of the cell and whether the network can discard it under heavy traffic conditions. Setting the bit to 1 indicates the network may discard the cell if necessary.
- **Header Error Control (HEC)**: The last byte of the header field contains the HEC. Its primary function is to guard against misdelivery of cells due to header or single bit errors. However, the HEC does not gauge the quality of the data in the information field.

The Cell Information Field

Following the 5-byte cell header is a 48-byte information field containing user data. The ATM adaptation layer (AAL) organizes the data in this field. Refer to “ATM Layers,” later in this chapter, for additional information about the AAL.

Data Transmission

Data transmission (also called *cell switching*) through the ATM network relies on the establishment of logical connections between ATM entities. ATM is a *connection-oriented* service. This means that an ATM entity cannot transmit information until it establishes a connection with a receiving entity. These connections consist of *virtual channels*, *virtual paths*, and *transmission paths*.

A virtual channel is a logical connection between two communicating ATM entities. Each virtual channel may carry a different protocol or traffic type. The virtual channel transports cells that have a common identifier. The identifier is called the virtual channel identifier (VCI) and is part of the cell header. You can establish virtual channels permanently or set them up dynamically, allowing the network to adjust itself to the traffic demand.

A virtual path is a set of virtual channels between a common source and destination. The virtual channels in a virtual path logically associate to a common identifier. This identifier is called the virtual path identifier (VPI) and is part of the cell header. You can base cell switching on either the VPI alone, or on a combination of the VPI and VCI.

Virtual paths enable you to separate network transport functions into those related to an individual logical connection (virtual channel) and those related to a group of logical connections (virtual path).

A transmission path is a physical connection that comprises several virtual paths, each virtual path containing several virtual channels. The transmission path may support multiple virtual paths across a single connection to the network.

Figure 2-3 shows the relationships between the virtual channel, the virtual path, and the transmission path.

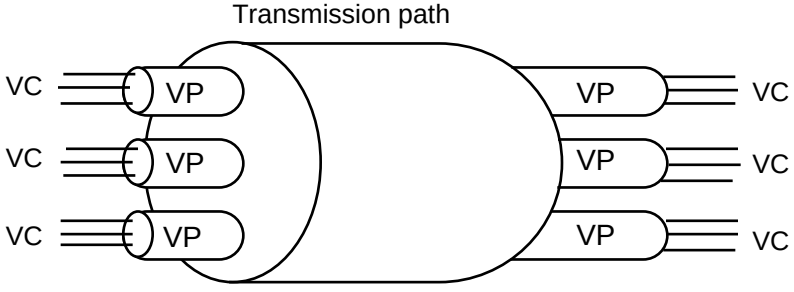


Figure 2-3. ATM Transmission Components

Permanent and Switched Virtual Connections

Virtual channels and virtual paths allow you to establish virtual channel links (VCLs). You can create VCLs as either permanent virtual circuits (PVCs) or switched virtual circuits (SVCs). Once you establish a PVC, you can transfer information over it at any time. Switched virtual circuits only activate, through signaling and network switching, when there is information ready for transmission.

Physical Layer

In a Bay Networks router, Intelligent Link Interface (ILI) pairs provide access and processing. An ILI pair consists of a link module and a processor module that work together to process and transmit information over a network. Bay Networks currently provides the following ATM ILI pairs:

- An ATM FRE2 link module in conjunction with a Fast Routing Engine (FRE2) processor
- An ATM Routing Engine (ARE) link module in conjunction with an ATM Routing Engine processor

In addition, Bay Networks provides a hub version of the ATM ARE ILI pair, the Model 5780 ATM router. This single hub module, incorporating the ILI functions of both the link module and processor module, resides in a System 5000 chassis. Refer to *Using the Model 5780 ATM Router* for more information.

Both ILI pairs and the Model 5780 ATM router are functionally similar, and you configure them in much the same way. Unless otherwise noted, the remainder of this guide treats both ILI pairs and the Model 5780 as if they were the same.

Depending on the ATM router type, you can connect directly to an ATM network over any of the following physical interfaces:

- Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH)
- Digital Service level 3 (DS-3)
- E-3 (the European equivalent of the North American DS-3)

This means that any of the ATM routers convert variable-length packets into uniform, 53-byte cells for transmission over the ATM network.

Although we use raw bandwidth to describe line rates, inherent overhead within the media limits maximum bandwidth for the line. Use Table 2-1 to determine the maximum bandwidth for the media you are using.

Table 2-1. Maximum Bandwidth

Media	Raw Bandwidth (Mb/s)	Maximum Bandwidth (Mb/s)	Maximum Cells/s
OC-3 SONET/SDH	155	149.76	353207
DS-3	44.736	40.704	96000
E-3 (G.832 Framing)	34.368	33.920	80000
E-3 (G.751 Framing)	34.368	30.528	72000

ATM Layer

The B-ISDN protocol reference model, on which ATM is based, consists of four layers. Each layer communicates only with the layers directly above it or directly below it. Figure 2-4 shows the B-ISDN ATM protocol reference model.

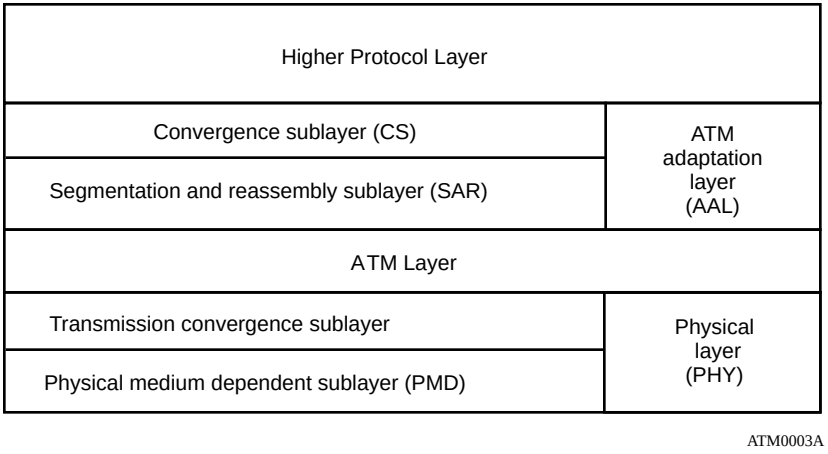


Figure 2-4. B-ISDN ATM Protocol Reference Model

The following layers relate directly to how Bay Networks routers support ATM:

- ATM layer
- ATM adaptation layer (AAL)

The *ATM layer* defines how two nodes transmit information between them. It is concerned with the format and size of the cells and the contents of the headers. The addresses of the cells are meaningful only to the two adjacent local nodes (that is, usually not to the end nodes).

The *ATM adaptation layer (AAL)* converts higher-layer protocol data into formats that are compatible with the requirements of the ATM layer, enabling ATM to handle different types of information all within the same format.

The AAL is divided into two sublayers: the *convergence sublayer (CS)* and the *segmentation and reassembly (SAR) sublayer*. These two sublayers convert variable-length messages into 48-byte segments, while ensuring the integrity of the data.

The CCITT (now ITU-T) has defined different types of AALs to handle different kinds of traffic. Bay Networks ATM routers support AAL 5.

ATM Adaptation Layer (AAL5)

Bay Networks ATM routers support a CS function compatible with AAL 5, as defined in Section 1 of the CCITT (now ITU-T) *B-ISDN Protocol Reference Model* (PRM).

In AAL 5, only a trailer attaches to the data from the higher layer protocols to create a CS PDU. AAL 5 divides the PDU into a 48-octet SAR PDU; however, it does not add an SAR header and trailer. This 48-octet SAR PDU becomes the payload of the ATM cell (Figure 2-5).

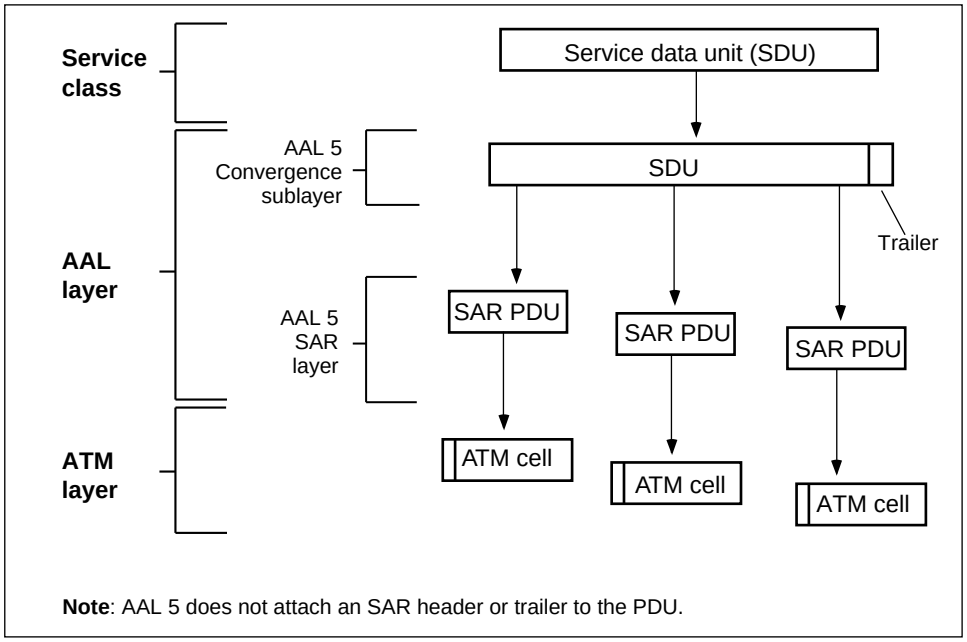


Figure 2-5. ATM Adaptation Layer 5

Service Records and Virtual Circuits

ATM devices communicate using virtual circuits. These VCs transmit and receive ATM cells containing upper-layer protocols. Bay Networks ATM routers use service records to provide a way of creating logical interfaces (within the physical ATM interface) for these upper-layer protocols. In essence, these service records allow you to

- Organize multiple VCs into logical groups
- Create direct, point-to-point connections
- Assign, delete, and modify upper-layer protocols for just one PVC, or for a group of VCs, at any given time

Data Encapsulation

Bay Networks ATM routers support multiprotocol encapsulation (as defined in RFC 1483), enabling the router to multiplex (combine) and demultiplex (separate) bridged or routed protocol data units (PDUs).

For transmission, the encapsulation process adds a header between two and eight octets in length to the PDU to allow decoding. The decoding process determines the proper service access point (SAP).

When receiving information, the encapsulation method evaluates the header to determine whether the PDU is a valid routed or bridged cell. If it is valid, the encapsulation method then strips the header from the cell and passes it to the appropriate SAP for routing or bridging.

You can choose from four data encapsulation types: LANE, LLC/SNAP, NLPID, and NULL. How you assign a data encapsulation type and which data encapsulation type takes precedence depends on the virtual circuit type and, for PVCs, the order in which you assign the encapsulation type.

Encapsulation Methods

Each ATM device must encapsulate PDUs before sending them to the SAR sublayer.

LANE

LANE provides Ethernet (IEEE 802.3) encapsulation of ATM PDUs for transmission over an emulated LAN. You can assign LANE to SVCs only.

LLC/SNAP Encapsulation

Logical Link Control / Subnetwork Access Protocol (LLC/SNAP; RFC 1294) allows multiplexing of multiple protocols over a single ATM virtual circuit. In this approach, an IEEE 802.2 Logical Link Control (LLC) header prefixes each PDU. You can assign LLC/SNAP encapsulation to

- PVC service records

- SVC service records
- Individual PVCs

Note: Assigning LLC/SNAP to an SVC service record automatically invokes the technology defined in RFC 1577, Classical IP and ARP over ATM.

NULL Encapsulation

RFC 1483 refers to this method as "VC-based multiplexing." This method performs higher-layer protocol multiplexing implicitly using ATM virtual circuits. You can assign NULL encapsulation to

- PVC service records
- SVC service records
- Individual PVCs (that are also members of an LLC/SNAP service record)

Note: Assigning NULL to an SVC service record automatically invokes the technology defined in RFC 1577, Classical IP and ARP over ATM.

NLPID Encapsulation

Originally developed for Frame Relay networks, you can use Network Layer Protocol ID (NLPID; RFC 1490) in an ATM environment for Frame Relay/ATM internetworking. You can assign NLPID encapsulation to PVC service records.

Selecting a Data Encapsulation Method

Generally speaking, the designers of these data encapsulation methods envisioned that NULL encapsulation would dominate in environments where dynamic creation of large numbers of ATM VCs is fast and economical. These conditions usually exist in private ATM networks.

LLC/SNAP encapsulation is an alternative for environments in which it is not practical to have a separate VC for each carried protocol (for example, if the ATM network supports only PVCs, or if charging depends heavily on the number of simultaneous virtual circuits).

The choice of multiplexing methods that two ATM stations use to exchange connectionless network traffic depends on the type of virtual circuit involved:

- For PVCs, you select the multiplexing method when you manually configure the connection.
- For SVCs, the stations themselves negotiate the multiplexing method by sending B-ISDN signaling messages. These messages include “low-layer compatibility” information that allows negotiation of AAL5 and the carried (encapsulation) protocol.

Note: Routed and bridged PDUs are always encapsulated within the payload field of the AAL5 CPCS PDU, regardless of the selected multiplexing method.

LLC/SNAP Encapsulation

When the same virtual circuit carries several protocols, select LLC/SNAP encapsulation. LLC/SNAP encapsulation attaches an LLC/SNAP header before the PDU. This header includes information that the receiver needs to properly process the incoming PDU. For bridged PDUs, this header also includes the type of the bridged media.

NULL Encapsulation (VC-Based Multiplexing)

In NULL encapsulation, the carried network protocol is identified implicitly by the virtual circuit connecting the two ATM stations. Because each protocol must travel over a separate virtual circuit, there is no need to include explicit multiplexing information in the payload of the PDU. This means that the bandwidth requirements and processing overhead remain minimal.

You can either manually configure the carried protocol or let the signaling procedures negotiate it dynamically during call establishment.

NULL encapsulation cells do not receive a header in a routed environment. In a bridged environment, the content of the PDU itself includes the necessary information for bridging the multiplexed protocols.

Encapsulation Rules for PVCs

How you assign data encapsulation to individual PVCs depends somewhat on the data encapsulation type you have assigned to the service record that contains those PVCs. Table 2-2 provides suggestions for assigning data encapsulation to PVCs and Hybrid PVCs that reside on these service records.

Table 2-2. Assigning Data Encapsulation to Individual PVCs

Service Record data encapsulation type	Individual PVC data encapsulation type	Hybrid PVC data encapsulation type
LLC/SNAP	NULL or LLC/SNAP	LLC/SNAP
NULL	NULL or LLC/SNAP	LLC/SNAP
NLPID	NLPID	NLPID

When assigning a data encapsulation type to a PVC or group of PVCs, keep the following in mind:

- The Site Manager ATM Service Records List and ATM Virtual Channel Link windows initially contain a default data encapsulation type of LLC/SNAP.
- When you add a PVC, it reads and uses the data encapsulation type specified in its ATM service record.
- You can globally assign a data encapsulation type to all nonhybrid PVCs in a particular service record, or you can assign a data encapsulation type to individual group PVCs using the Site Manager ATM Virtual Channel Link window.

Caution: Changing the data encapsulation type at the service record level changes the data encapsulation type for all nonhybrid PVCs on that service record. For example, if you change the ATM service record data encapsulation type from LLC/SNAP to NULL, the data encapsulation type for all PVCs (except hybrid PVCs) on that service record changes to NULL. Site Manager does not ask you to verify this change.

- If you change the data encapsulation value in the Site Manager ATM Service Records List window, all new PVCs that you add to that service record use the new value.

- You must assign a data encapsulation type to hybrid mode PVCs individually, using the Site Manager ATM Virtual Channel Link window. You cannot assign data encapsulation to a hybrid mode PVC using the service record.
- When you use the copy function, the new PVC uses the data encapsulation type of the existing PVC.

PVC Access Methods

You can set up PVCs to access an ATM network in the following ways:

- Multiple PVCs per service record
- One PVC per service record
- Hybrid access PVCs

Multiple PVCs

Upper-layer protocols treat each service record on an ATM network interface as a single access point. These protocols use a single network address to send all traffic destined for the network to the ATM network interface. Figure 2-6 shows a conceptual drawing of multiple PVCs accessing an ATM network through one service record.

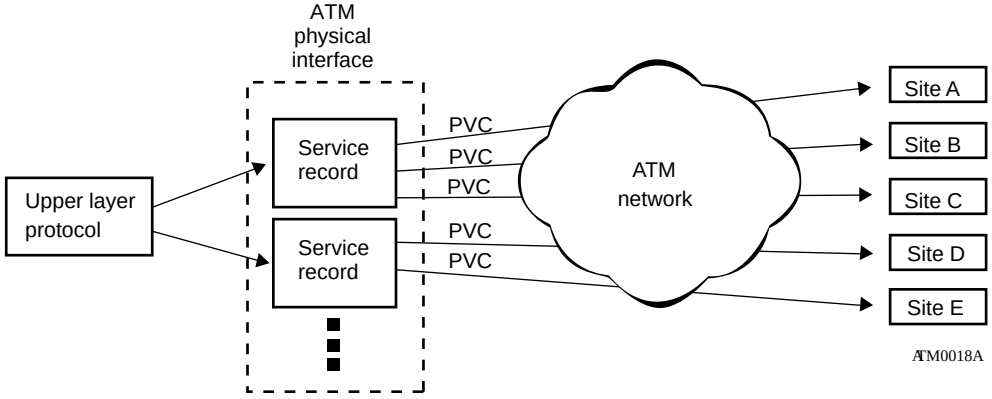


Figure 2-6. Multiple PVCs per Service Record

Of the different methods, having multiple PVCs per service record uses network addressing most efficiently, and is the easiest to configure.

Although you need to configure each PVC manually, you need only define and associate protocols with the ATM network service record. All the PVCs that you configure for a given ATM service record carry the protocols that you select and configure to run on that service record.

Note: When you configure multiple PVCs per service record, the PVCs all use the data encapsulation type that you set for the ATM service record (that is, the value of the Data Encapsulation Type parameter set in the ATM Service Records List window). Refer to "Data Encapsulation," earlier in this chapter, for more information.

Multiple PVCs per service record works best in either fully meshed environments or in nonmeshed environments where systems not directly connected to each other have no need to communicate. You can configure multiple PVCs per service record as long as you do not need to separate protocols by PVC (that is, all PVCs accept the same protocols).

There are, however, ways to configure upper-layer protocols, such as IP or Internet Packet Exchange (IPX), to allow systems in nonmeshed networks to fully communicate. See the documentation for these upper-layer protocols for more information.

One PVC

One PVC per service record works the same way as multiple PVCs per service record, except that you assign only one PVC per service record. When you define only one PVC per service record, upper-layer protocols treat the ATM network as a series of direct, point-to-point connections, viewing each PVC as an individual network interface.

You can, therefore, configure each PVC with different protocols and parameter settings. This allows you to connect to different network sites using, for example, different types of data encapsulation (Figure 2-7).

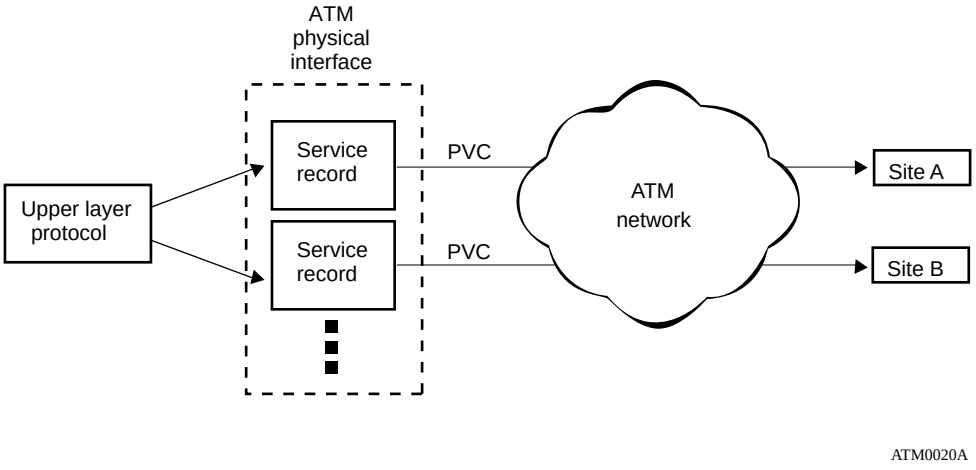


Figure 2-7. One PVC per Service Record

Assigning one PVC per service record allows you to dedicate a PVC to a particular protocol, but at the expense of some configuration overhead, memory, and address space.

This type of configuration is best suited to small, nonmeshed configurations, or to configurations in which protocols must reside on separate PVCs.

Note: The maximum number of PVCs you can configure in this way varies, depending on the configuration of the router, the number of protocols running on the circuits, and the number of routing entries.

Hybrid Access

PVCs do not typically allow for bridging in nonmeshed environments. If your network combines bridging and routing over the same interface, you need to use the service record portion of each PVC for routing, while at the same time allow bridging to operate. To do this, you must define the PVC as a hybrid/bridged VC.

Defining the PVC as a hybrid/bridged VC allows the bridge to view each PVC as a separate bridge interface while allowing the routing protocols to view all PVCs as part of the same interface (Figure 2-8).

Use hybrid PVCs when creating nonmeshed network configurations that use both bridging and routing over a single ATM interface. These PVCs work best for spanning tree bridging.

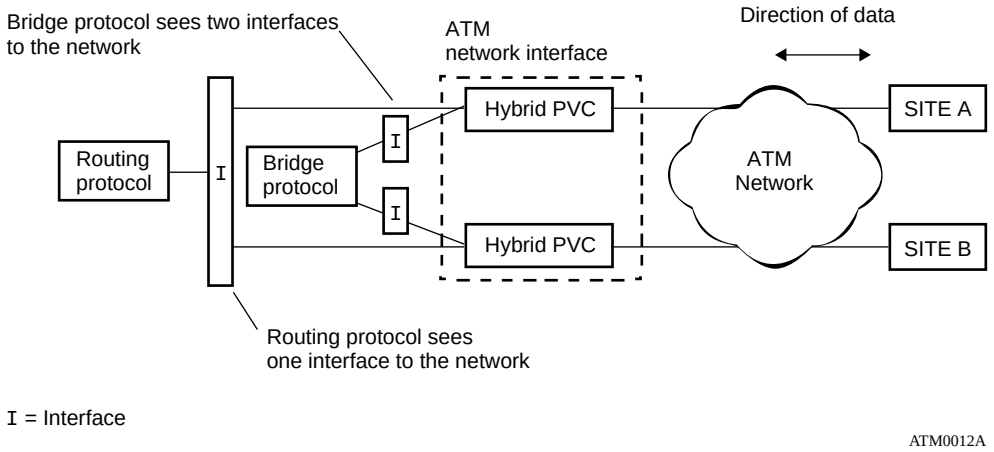


Figure 2-8. Hybrid PVCs

Note: When you define a PVC as a hybrid/bridged VC, Site Manager provides additional Bridge, Spanning Tree, and Native Mode LAN (NML) protocol options. These protocols run on the PVC along with the protocols defined in the ATM service record.

Using Hybrid PVCs for Transparent Bridging

In Figure 2-9, traffic bridges between Site A and Site B. The bridge (Router 1) is running on the ATM network interface, and its PVCs are *not* defined as hybrid/bridged VCs.

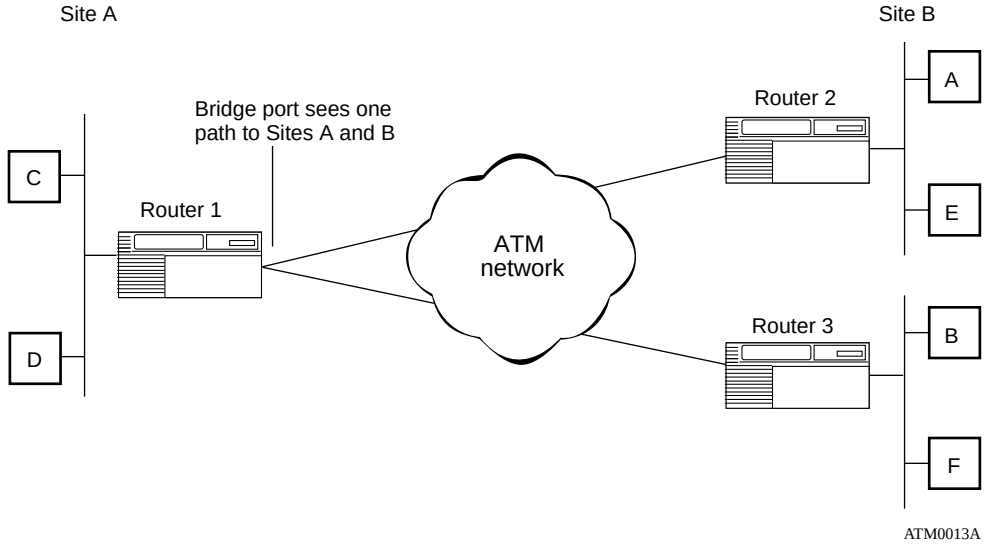


Figure 2-9. Example of a Bridged Network

In this example, the bridge receives data from Site A. If the bridge does not recognize the destination address, it tries to direct traffic through another bridge port. However, since the PVCs are not defined as hybrid/bridged VCs, the ATM bridge port views the paths to Site A and Site B as the same.

A bridge does not send out the same data over the bridge port from which it just received the data. This means that the bridge cannot direct the data to Site B. To resolve this problem, you need to designate the PVCs as hybrid/bridged VCs.

If you define the PVCs as hybrid VCs (refer to Figure 2-8), each PVC acts as a separate bridge port. This enables the bridge running on the ATM interface to view the traffic from Site A as arriving on a different port than that of Site B. When the bridge sends out data, it now has access to all its ports, including the port that accesses Site B. Therefore, data from Site A can reach Site B.

SVC Access Methods

SVCs use signaling messages to dynamically establish, maintain, and clear a switched virtual connection at the UNI. These messages (as defined by the Q.2931 standard for signaling protocol) allow the router to assess the availability of an ATM endpoint (device), establish a connection with that device, maintain that connection for the duration of data transfer, and then clear the connection when the transfer is complete.

ATM Traffic Parameters

The *ATM User-Network Interface Specification* defines several traffic parameters including

- Peak Cell Rate (PCR) -- The upper traffic rate limit for an individual VC
- Sustainable Cell Rate (SCR) -- The upper bound on the conforming average rate of an individual PVC or Control VC

  where

  A*verage rate* = The number of cells transmitted over the link divided by the duration of the connection

  Duration of the connection = The total amount of time it takes from connection setup to connection release
- Maximum Burst Size (MBS) -- The maximum length of a cell stream allowed on a particular VC

These parameters help to prioritize and control the traffic on each VC. For more information about each of these traffic parameters and how to customize them, refer to Chapter 7.

How you assign your ATM traffic parameters depends on

- The characteristics of the individual connections that you want to set up (for example, the desired maximum cell rate, average cell rate, and burst size)
- The bit-rate method -- variable or available -- that the ATM ILI pair uses

You can change your ATM traffic parameters several times before deciding on a particular set. This section explains the different traffic parameters and provides some basic guidelines for customizing traffic parameters on an ATM PVC or ATM Control VC (that is, the signaling VC or interim local management interface VC).

Note: You do not need to manually configure traffic parameters for SVCs (as you must for PVCs and Control VCs), because SVCs dynamically negotiate these parameters before transferring data.

Variable Bit Rate Versus Available Bit Rate

Bay Networks currently provides the following ATM ILI pairs:

- An ATM FRE2 link module in conjunction with a FRE2 processor
- An ARE link module in conjunction with an ARE processor

Either ILI pair allows the router to connect directly to an ATM network over an ATM physical interface. However, depending on the ATM ILI pair, the method of determining bandwidth varies.

Variable Bit Rate

ATM FRE2 ILI pairs use variable bit rate (VBR) to determine bandwidth allocation. VBR allows the VC to accumulate credits whenever it does *not* use any bandwidth within its specified average. When this VC does use bandwidth, the accumulated credits allow it to transmit using the Peak Cell Rate (PCR).

Available Bit Rate

ATM ARE ILI pairs use available bit rate (ABR) to determine bandwidth allocation. ABR is a method by which the bandwidth is separated into a guaranteed portion (for PVCs and control VCs) and an available portion (for data SVCs).

Note: Bay Networks does not currently incorporate ABR congestion control features as defined by the ATM Forum.

Rules for Editing Protocols

Though specific protocol windows appear when you first add and define a service record, you must follow a few specific rules when editing protocols.

Depending on the type of virtual circuit you are using, Site Manager requires you to add additional protocols, or delete and edit existing protocols, using specific protocol menus.

Use Table 2-3 to locate the appropriate protocol menu for each access mode.

Table 2-3. Locating and Using Protocol Menus

Menu Location	PVCs and SVCs	Hybrid PVCs Only
ATM Service Record List window	✔*†	✔†
ATM Virtual Channel Link window		✔*

* For nonbridging protocols.
† For bridging protocols.

Remember, hybrid PVCs use their service record configurations for nonbridging protocols and their individual configurations for their bridging protocols.

ARP and Inverse ARP Support

ATM supports address resolution protocol (ARP), enabling the router to dynamically resolve IP network layer protocol-to-VPI/VCI address mappings. ATM learns the address of the virtual circuit by detecting the virtual circuit that delivered the ARP response.

ATM also supports Inverse ARP. However, you can use Inverse ARP only if both the local and remote router support it.

Bay Networks uses both proprietary and standard ARP and Inverse ARP for PVCs that run IP. Which method the PVC uses depends on how you configure the address resolution parameter for the IP interface. Refer to *Configuring IP Services* for additional information about the IP address resolution parameter.

Bay Networks uses standard ARP and Inverse ARP for SVCs running Classical IP (RFC 1577) and SVCs running LAN emulation.

ATM Error Checking

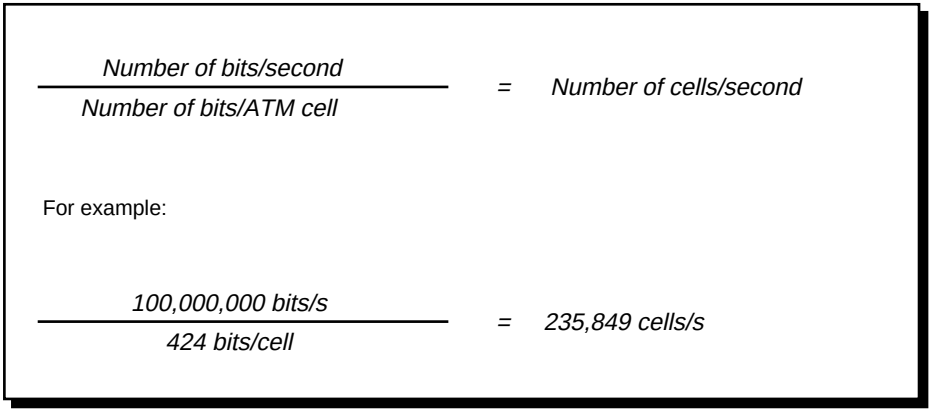
ATM verifies that the VPI/VCI is valid with respect to the PVCs configured for the ATM circuit. It also verifies the header format. ATM verifies valid SVC connection through signaling messages.

Simulated Multicast Packet Support

Simulated multicasting is generally used in certain address resolution techniques and for applications that require the delivery of identical information to multiple recipients. Bay Networks ATM routers simulate multicasting by sending a copy of the multicast or broadcast packet to every available virtual circuit on a particular logical interface.

Converting Mb/s to Cells/s

Several ATM traffic parameters require you to enter values in cells per second (cells/s). To convert to cells/s, divide the number of bits/s by 424 (the number of bits per ATM cell).



ATM0021A

Example of an ATM Network

An ATM network often contains components -- both hardware and software -- that provide various forms of connectivity or necessary management functions. This section

- Illustrates how Bay Networks ATM hardware and software components logically fit together within a sample ATM network
- Provides basic functional descriptions of the ATM hardware and software components used in the sample network

This sample network (Figure 2-10) consists of all the components necessary to fully operate an ATM network. Depending on how you configure the individual hardware and software components, you can run standard ATM PVCs and SVCs, configure logical IP subnets using RFC 1577, and create virtual LANs (VLANs) using LAN emulation.

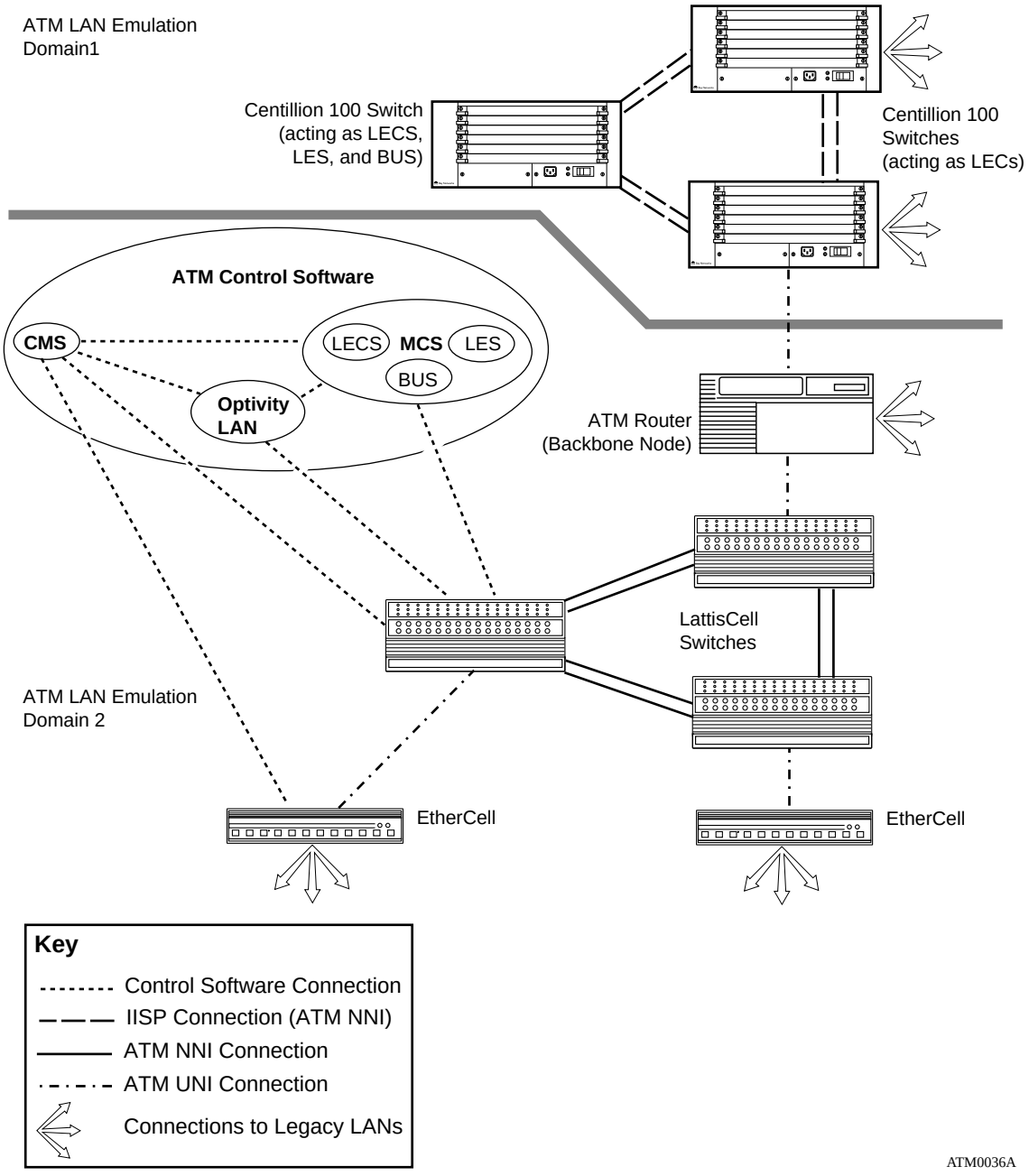


Figure 2-10. Sample ATM Network

Hardware Devices

Bay Networks provides various ATM hardware devices, each of which provides a different form of access within the ATM network. The ATM sample network in this appendix uses the following ATM hardware devices:

- LattisCell switches
- EtherCell switch
- Centillion 100 switch
- Backbone Node containing an ATM ILI pair

In addition to the Bay Networks equipment, the example requires UNIX workstations to operate ATM network control software.

Function of the LattisCell Switch

Working in conjunction with network control software, the LattisCell switch acts as the backbone of the ATM network (refer to Figure 2-10). Multiple LattisCells can interconnect using network-to-network interface (NNI) links. These interconnecting LattisCells form larger ATM networks called ATM domains.

In addition to linking together with other switches, the LattisCell can also connect to user-to-network interface (UNI) clients. UNI clients (for example, routers, hubs, servers, and workstations equipped with ATM interfaces) reside on the edge of an ATM network. Some of these UNI clients (that is, the routers, hubs, and servers) can connect to other local or wide area networks.

For additional information regarding LattisCell features and how to install and use the LattisCell, refer to *Using the Model 101xx LattisCell ATM Switch*.

Function of the EtherCell Switch

The EtherCell Ethernet-to-ATM switch connects existing Ethernet networks or endstations to ATM networks using high-speed data switching. This device supports twelve 10Base-T Ethernet interfaces and one ATM SONET/SDH (155 Mb/s) UNI interface.

The EtherCell performs the following five primary functions:

- Registers its interfaces with the Connection Management System (CMS)
- Sets up and clears calls through the CMS

- Segments Ethernet packets into ATM cells
- Reassembles ATM cells into Ethernet packets
- Communicates with the multicast server (MCS) to coordinate virtual LAN configuration

For additional information regarding EtherCell features and how to install and use the EtherCell, refer to *Using the Model 10328-X EtherCell Ethernet-to-ATM Switch.*

Function of the Centillion 100 Switch

The Centillion 100 integrates LAN switching and ATM to address a wide range of requirements that currently exist in LAN environments:

- Improving server performance by giving it a dedicated, switched-LAN port
- Segmenting congested LAN segments
- Concentrating multiple segments into a router
- Replacing multiple bridges
- Creating a multigigabit collapsed backbone

The Centillion 100 has an ATM switching backplane and a modular chassis that can accommodate up to six switch modules. Each switch module has multiple LAN interface and switching hardware that switches traffic among the local LAN ports. The only traffic that traverses the ATM backplane is the traffic destined for ports on a different switch module. The Centillion 100 supports parallel switching operations to maximize throughput.

The Centillion 100 supports three types of switch modules:

- TokenSpeed, a token ring switch module with four shielded twisted pair (STP), unshielded twisted pair (UTP), or fiber optic (either 16 Mb/s or 4 Mb/s) ports
- ATMSpeed/155, an ATM switch module with two ATM OC-3c (155 Mb/s) ports
- EtherSpeed, an Ethernet switch module with sixteen 10 Base-T (10 Mb/s) ports

For additional information regarding Centillion 100 features and how to install and use the Centillion 100, refer to *Centillion 100 Installation and Configuration.*

Function of the Router ATM ILI Pair

ATM router link modules interact with specific processor modules to form ILI pairs. These ILI pairs provide the connection and processing that allows the router to connect directly to an ATM network and route information to other local or wide area networks that it supports.

Bay Networks currently provides the following ATM ILI pairs:

- An ATM FRE2 link module in conjunction with a FRE2 processor
- An ARE link module in conjunction with an ARE processor

Both ILI pairs are functionally similar and you configure them in generally the same way.

Understanding the Configuration and Control Software

The sample ATM network consists of various control software components. Each of these components provides a necessary function within the ATM network.

Role of Site Manager

Site Manager software allows you to configure and monitor routing services (in this case, between emulated LANs or logical IP subnets) for ATM FRE2 ILI pairs, ATM ARE ILI pairs, and Model 5780 ATM routers. For general information about how to use Site Manager, refer to *Using Site Manager Software*.

Role of SpeedView

SpeedView software allows you to configure and monitor the Centillion 100 switch. For additional information about SpeedView software, refer to *Centillion 100 Installation and Configuration*.

Role of the CMS

The ATM CMS software provides connection services within the ATM network. Functions of the CMS include

- Managing call setup, maintenance, and clearing within a switch domain
- Negotiating network resources, a network path, and bandwidth prior to sending ATM traffic

- Ensuring that the required network resources, network path, and minimum bandwidth exist prior to sending ATM traffic
- Automatically sending calls along available paths and, in the event of a network fault, rerouting any new calls
- Collecting, combining, and filtering network management information before sending it to the Optivity LAN 7.0 software
- Providing a central boot server location for a switch and other devices within the network
- Supporting ILMI, signaling (Q.2931 and Q.SAAL), Quality of Service (QoS), and Connection Admission Control (CAC) traffic management services as defined within the ATM Forum *ATM User-Network Interface Specification* (Version 3.0)

Role of the MCS

The MCS software allows LANE services to operate over an ATM network. The MCS software provides the following LANE services:

- Virtual LAN definition and management
- MAC address-to-ATM address resolution for attached LANE clients
- Broadcast and multicast support for attached LANE clients

Role of Optivity LAN 7.0

The Optivity LAN 7.0 software provides management for any switch (including the EtherCell, LattisCell, and switch modules in the System 5000), link, or client in the ATM network.

Optivity LAN 7.0 obtains information from the CMS, MCS, or switches to display real-time views of the entire ATM network. These views provide the network manager with ATM monitoring and control information at both the switch and port level.

Refer to *Using Optivity LAN 7.0 for UNIX* and associated release notes for more information about using the Optivity LAN 7.0 software in an ATM network.

For More Information

For more information about ATM, refer to the following documents:

ATM Forum. *ATM User-Network Interface Specification*. Version 3.0. September 1993.

ATM Forum. *LAN Emulation Over ATM*. Version 1.0. January 1995.

Bellcore Document SR-NWT-001763, Issue 1. *Preliminary Report on Broadband ISDN Transfer Protocols*. December 1990.

———, FA-NWT-001109. *Broadband ISDN Transport Network Elements Framework Generic Criteria*. December 1990.

———, FA-NWT-001110. *Broadband ISDN Switching System Framework Generic Criteria.* December 1990.

De Prycker, M. *Asynchronous Transfer Mode: Solution for Broadband ISDN*. Ellis Horwood Limited, 1991.

Grossman, D., Hoffman, E., Liaw, F., Malis, A., Mankin, A., and Perez, M. *ATM Signaling Support for IP over ATM*. RFC 1755. Network Working Group. February 1995.

Handel, R. and Huber, M. *Integrated Broadband Networks: An Introduction to ATM-Based Networks*. Reading, Massachusetts: Addison-Wesley Publishing Company, 1991.

Heinanen, J. *Multiprotocol Encapsulation over ATM Adaptation Layer 5*. RFC 1483. Network Working Group. July 1993.

ITU-T. *B-ISDN – ATM Adaptation Layer – Service Specific Connection Oriented Protocol (SSCOP)*. Final Draft. March 10, 1994.

Laubach, M. *Classical IP and ARP over ATM*. RFC 1577. Network Working Group. January 1994.

Where to Go Next

Use the following table to determine where you want to go next.

For information about	Go to
Starting ATM	Chapter 1
General Classical IP over ATM information	Chapter 3
General LAN emulation information	Chapter 4
Customizing an ATM line	Chapter 5
Customizing an ATM interface or service record	Chapter 6
Customizing PVCs	Chapter 7
Customizing a LAN emulation client	Chapter 8
Customizing signaling	Chapter 9
Customizing ILMI	Chapter 10
Customizing signaling and ILMI control VCs	Chapter 11
Customizing SAAL	Chapter 12
Accessing Site Manager parameters	Appendix A
Site Manager defaults	Appendix B
ATM log files	Appendix C

Chapter 3
Understanding Classical IP over ATM Concepts

RFC 1577, *Classical IP and ARP over ATM*, describes an administrative entity within an ATM network called a logical IP subnet (LIS). Each ATM LIS consists of multiple network devices -- hosts and routers -- connected to the ATM network and configured with interfaces to the same IP subnetwork.

Each LIS operates and communicates independently of every other LIS in an ATM network. A host connected to an ATM network communicates directly with other hosts in its own LIS. To communicate with hosts in another LIS, the host must use an IP router. This router can connect to multiple LISs.

An ATM LIS must meet the following requirements:

- All members of the LIS (hosts and routers) must have the same IP network/subnet number and address mask.
- All members must be directly connected to the ATM network, using SVCs.
- All members must access hosts outside the LIS through a router.
- All members must be able to communicate by means of ATM with every other member of the LIS (that is, the virtual connection topology must be fully meshed).

An ATM LIS can replace an IP LAN. In Figure 3-1, for example, three IP host systems and an IP router have interfaces to an Ethernet LAN. To communicate with each other on the LAN, the devices use the MAC addresses of the LAN that they obtain using the ARP or by static configuration. For communications beyond the LAN, the devices use IP addresses.

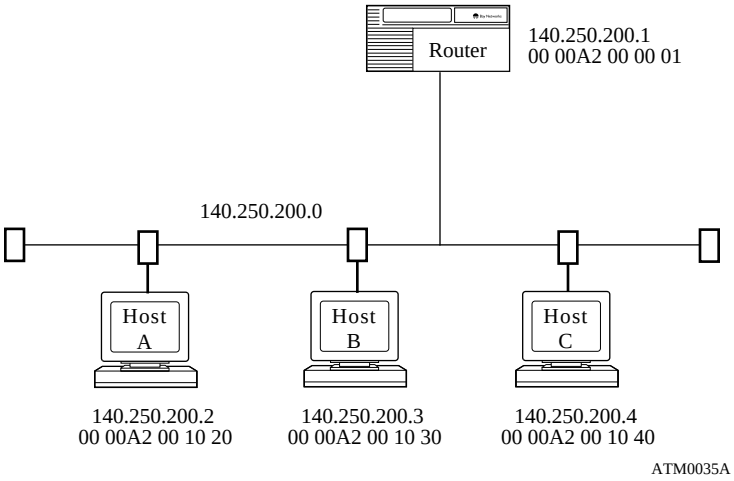


Figure 3-1. IP Local Area Network

In Figure 3-2, an ATM network replaces the LAN interfaces, creating a LIS. For communications within the LIS, the devices use ATM addresses obtained using ATMARP; for communications beyond the LIS, the devices use IP addresses.

For example, to send a message to Host B, Host A uses Host B's ATM address. To send a message to a host beyond the LIS, Host A uses an IP address to identify the remote host and sends the message to the local router, using the router's ATM address. The router forwards the message.

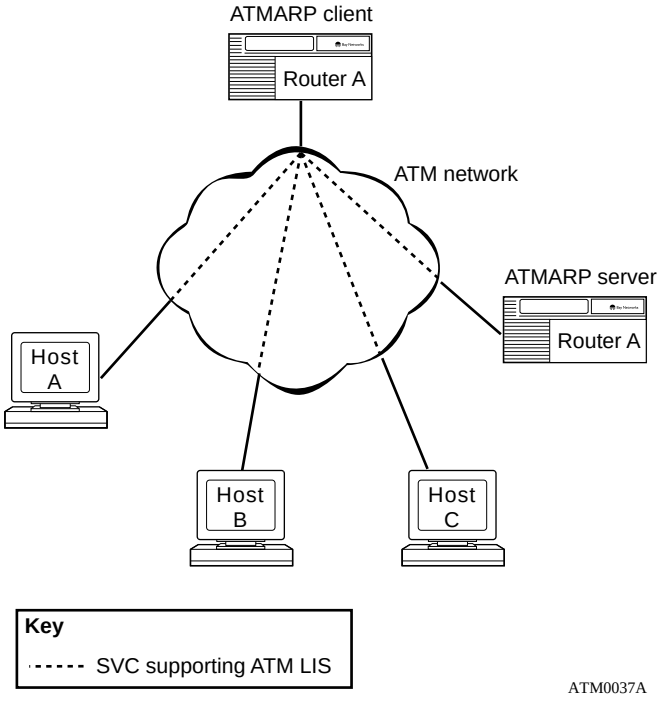


Figure 3-2. IP Logical IP Subnet

ATM Address Resolution

An address resolution protocol defines a mechanism that enables an IP router to use the IP address of a network device to learn the physical address of that device. An Ethernet LAN uses ARP as its address resolution scheme. A LIS uses an address resolution scheme called ATMARP as defined by RFC 1577.

On a LAN, defined as a broadcast medium, a router obtains the physical address of a network device by broadcasting an ARP request. In a LIS, which uses a nonbroadcast ATM medium, a router sends an ATMARP request to an ATMARP server.

Each IP interface on the LIS opens a VC to the ATMARP server and registers its IP address and ATM address (Figure 3-2). Using this information, the server builds and maintains a table that maps LIS IP addresses to ATM addresses.

A router that needs the ATM address of a host on the LIS sends an ATMARP request to the server. When the server returns a response containing the address, the router extracts the ATM address of the host from the response and opens an SVC directly to the host using ATM UNI signaling.

If the server does not have an entry for the requested IP address, it returns a negative acknowledgment, signifying that the destination is unreachable.

Configuring an ATM Service Record for ATMARP

When configuring a service record to act as an ATMARP client or server:

- Define a Classical IP service record
  - -- Specify SVC as the virtual circuit type for the service record. All network devices on a LIS must connect over SVCs.
  - -- Specify LLC/SNAP or NULL as the encapsulation type for the service record. RFC 1577 defines LLC/SNAP as the encapsulation type for ATMARP.

Note: For more information on how to create an SVC service record to run Classical IP, refer to Chapter 1.

- Add IP and IP routing protocols to the circuit.
- Configure ATMARP to run on the router as a client or a server.

Note: For full compatibility with RFC 1577, you may have to specify a maximum transmission unit (MTU) size of 9188 bytes. Refer to *Configuring Line Services* for additional information about setting the MTU size.

For your convenience, Appendix A describes ATM-specific IP parameters necessary for Classical IP ATMARP operation over ATM. Refer to “ATMARP Configuration Parameter Descriptions” for details.

Note: If you remove and replace a link module that is configured to act as an ATMARP client, the client loses connectivity until the ATMARP Server Reg Interval parameter for that client expires (900-second default). This occurs only when the client is configured to autogenerate the ATM address user part (refer to Chapter 6 for additional information on autogenerating ATM addresses).

Configuring an ATM Address for an Adjacent Host

An adjacent host is a network device on the local LIS. You must configure an ATM address for all hosts on the LIS that do not use ATMARP.

Appendix A describes ATM-specific IP parameters for creating adjacent hosts in a Classical IP over ATM environment. Refer to “Adjacent Host Parameter Descriptions” for details.

Refer to *Configuring IP Services* for more information about adding, editing, and deleting adjacent hosts.

Editing an ATMARP IP Interface

After you configure ATMARP on an IP interface, you can modify characteristics of the client or server by editing ATM-specific IP parameters.

Appendix A describes ATM-specific IP parameters necessary for Classical IP operation within an ATM environment. Refer to “IP Interface Parameter Descriptions” for details.

Where to Go Next

Use the following table to determine where you want to go next.

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Starting ATM	Chapter 1
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Customizing signaling and ILMI control VCs	Chapter 11
Customizing SAAL	Chapter 12
Accessing Site Manager parameters	Appendix A
Site Manager defaults	Appendix B
ATM log files	Appendix C

Chapter 4
Understanding ATM LAN Emulation Concepts

This chapter provides general information about LAN emulation as described by the ATM Forum. For more information about LAN emulation, refer to the ATM Forum document *LAN Emulation Over ATM* (Version 1.0).

Refer to Chapter 8 for instructions on how to customize LAN emulation on your ATM router.

LAN Emulation Basics

LAN emulation allows virtual communication of traditional LAN devices and applications over an ATM network. An ATM network can run one or more emulated LANs. However, each emulated LAN is independent of the others and devices cannot communicate directly across emulated LAN boundaries.

Note: Communication between emulated LANs is possible through routers and bridges only (possibly implemented on the same endstation).

LAN Emulation Connectivity

An emulated LAN can provide Ethernet (IEEE 802.3) or Token Ring (IEEE 802.5) connectivity. With an emulated Ethernet or Token Ring network over ATM, software applications can interact as if they were connected to a traditional LAN.

Note: Bay Networks currently supports only Ethernet (IEEE 802.3) emulated LAN connectivity.

LAN Emulation Components

Each ATM domain contains a LAN emulation configuration server and each emulated LAN comprises a group of LAN emulation clients, a LAN emulation server (LES) and a broadcast and unknown server (BUS). These servers provide specific LAN emulation services.

LAN Emulation Clients

The LAN emulation client (LE client or LEC) is the interface, or virtual portion of an interface, through which an endstation forwards data, resolves addresses, and provides other control functions. The LE client provides the MAC-level emulated Ethernet or Token Ring service interface to the higher-level software. It also controls the LAN emulation UNI (LUNI) interface when communicating with other devices on the emulated LAN.

LAN Emulation Configuration Server

The LAN emulation configuration server (LECS) assigns individual LE clients to different emulated LANs. The LECS does this by giving the client the ATM address of the LAN emulation server (LES). This method allows you to assign a client to an emulated LAN based on the client's physical location (ATM address) or the identity of a LAN destination it represents.

The LE client uses the configuration protocol to obtain information from the LECS. This configuration protocol allows the LE client to locate the LES and set up a bidirectional, control direct virtual channel connection. The LE client automatically obtains all of the necessary configuration data (including the LES address) from the LECS.

LAN Emulation Server

The LES controls and coordinates LE client access to the emulated LAN. When an LE client joins an emulated LAN, it registers its ATM address with the LES. When it obtains the ATM address of the LE client, the LES also obtains the physical location of the LE client (from the MAC address or route descriptor).

Having both the ATM addresses and the physical locations of all LE clients on the emulated LAN allows the LES to coordinate access among LE clients. In other words, other LE clients query the LES to obtain the ATM address associated with a specific MAC address or a route descriptor. After an LE client receives the ATM address of the LE client it wants to reach, the individual clients communicate directly.

Broadcast and Unknown Server

To emulate a traditional LAN, the emulated LAN must provide the connectionless data delivery characteristics of a shared network to its LE clients. This means that the emulated LAN must also be able to handle broadcast and multicast data. The broadcast and unknown server (BUS) addresses this requirement by distributing all broadcast, multicast, and unknown traffic to and from all LE clients on an emulated LAN.

For example, when an LE client sets up its initial configuration, it obtains the MAC address of the BUS from the LES. Using this MAC address, the LE client sets up a multicast send VCC to the BUS. In turn, the BUS registers the LE client as part of its emulated LAN.

To broadcast data, an LE client uses the multicast send VCC to send information to the BUS. The BUS then retransmits the data, through multiple point-to-point connections or one point-to-multipoint connection, to each LE client on the emulated LAN.

Understanding LAN Emulation States

As defined in the ATM Forum *LAN Emulation Over ATM* specification, LE clients enter various states of communication while attempting to join an emulated LAN. These states (referred to as "phases" by the ATM Forum) indicate the progress of an LE client as it connects with an emulated LAN (Figure 4-1).

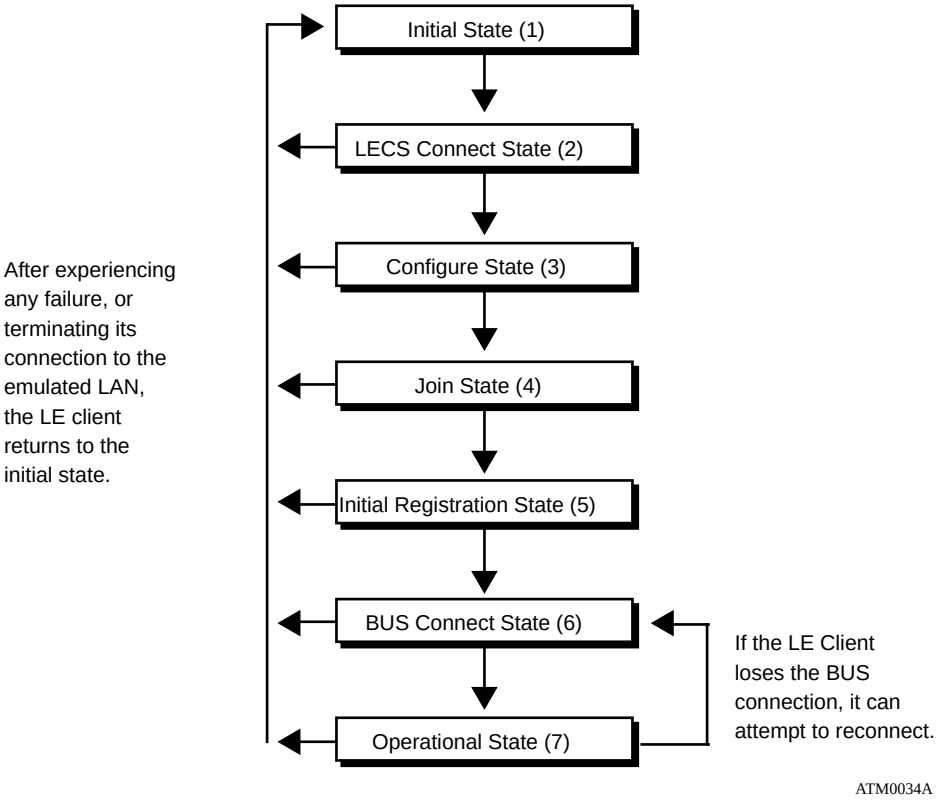
Initial State (1)
LECS Connect State (2)
Configure State (3)
Join State (4)
Initial Registration State (5)
BUS Connect State (6)
Operational State (7)
After experiencing any failure, or terminating its connection to the emulated LAN, the LE client returns to the initial state.
If the LE Client loses the BUS connection, it can attempt to reconnect.
ATM0034A

Figure 4-1. LAN Emulation States

Note: The numbers that follow each individual state appear in the ATM LEC status record (wfAtmLecStatusEntry).

Refer to the following sections to better understand each state.

Initial State

An LE client always starts in the initial state before attempting to connect to the LECS.

LECS Connect State

An LE client enters the LECS connect state when it attempts to connect to the LECS.

Configure State

An LE client enters the configure state when it attempts to retrieve necessary information (that is, the ATM address of the LES, LAN type, LAN name, Maximum MTU, and various timeout values) to begin joining an emulated LAN.

Join State

An LE client enters the join state when it attempts to join an emulated LAN. Joining an emulated LAN requires that the LE client

- Set up a control VCC to communicate with the LES
- Send a join request (containing the client MAC address) to the LES
- Accept a control distributed VCC to receive control data from the LES
- Receive a valid join response from the LES containing a LAN emulation client ID (LECID)

Note: No more than one ATM LE client per Bay Networks router ILI pair can join an emulated LAN at any point in time. However, you can always move a LAN emulation client to the desired emulated LAN using network management software (for example, the Bay Networks Network Management Application software).

Initial Registration State

An LE client enters the initial registration state when it attempts to register multiple MAC addresses with the LES.

Note: The router LE client provides the MAC address only for its own ATM interface. Because it does not register multiple MAC addresses, the router never enters this state. The router LE client acts as a proxy for bridge MAC addresses not learned on this circuit.

BUS Connect State

An LE client enters the BUS connect state when it attempts to set up a VCC to the BUS.

Operational State

An LE client enters the operational state after successfully completing the requirements to join an emulated LAN.

Where to Go Next

Use the following table to determine where you want to go next.

For information about	Go to
Starting ATM	Chapter 1
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General Classical IP over ATM information	Chapter 3
Customizing an ATM line	Chapter 5
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Customizing PVCs	Chapter 7
Customizing a LAN emulation client	Chapter 8
Customizing signaling	Chapter 9
Customizing ILMI	Chapter 10
Customizing signaling and ILMI control VCs	Chapter 11
Customizing SAAL	Chapter 12
Accessing Site Manager parameters	Appendix A
Site Manager defaults	Appendix B
ATM log files	Appendix C

Chapter 5
Customizing an ATM Line

The type of ATM link module you use in your router determines how you edit the line details. This chapter describes how to customize the various line details, including

- Attributes specific to ATM FRE2 ILI pairs
- Attributes specific to ATM ARE ILI pairs and the Model 5780 ATM router

Modifying ATM FRE2 Line Details

This section describes how to edit the line details for ATM FRE2 link modules.

Enabling and Disabling the ATM Line

By default, when you create an ATM circuit, the physical line (or the interface to that line) is enabled. You can enable or disable the ATM circuit for the specific connector without having to remove the physical line from the ATM receptacle.

Site Manager: Enable: page A-5

Enabling and Disabling Data Path Notify

When enabled (the default setting), the Data Path Notify function disables the data path interface when the physical interface becomes nonoperational. When you disable the Data Path Notify function, the data path interface remains operational even when the physical interface is not working.

Site Manager: Data Path Notify: page A-6

Specifying the Data Path Notify Timeout Value

When you enable the Data Path Notify function, you must also specify how long you want the ATM router to wait before implementing this function. By default, when the state of the physical interface changes from operational to nonoperational, the timer waits 3 seconds before implementing the Data Path Notify function. However, you can adjust this value from 0 through 3600 seconds.

Site Manager: Data Path Notify Timeout: page A-6

Enabling or Disabling SVC Inactivity Timeout

By enabling the SVC Inactivity Timeout function (the default), the router automatically disables any SVCs that have not received or transmitted any cells for the period of time you specify (see the section below).

If you disable the SVC inactivity timeout function, all SVCs on the line remain open until you close them by another method.

Site Manager: SVC Inactivity Timeout Enable: page A-6

Specifying an SVC Inactivity Timeout (In Seconds)

When you enable the SVC Inactivity Timeout function, you must also specify how long you want the ATM router to wait before implementing this function. By default, if the router does not receive or transmit any cells for 1200 seconds, the SVC Inactivity Timeout function activates. However, you can adjust this value from 60 through 3600 seconds.

Site Manager: SVC Inactivity Timeout (Secs): page A-7

Modifying ATM FRE2 Physical Attributes

The physical attributes of the ATM line include framing information, transmission checks, and how ATM treats the line under certain conditions (for example, when the line is idle).

Assigning the Framing Mode

You can assign an ATM line to use either SONET or SDH framing mode.

By default, the ATM line uses SONET framing. This method uses a 51.84 Mb/s synchronous transport signal (STS-1) as a basic building block to provide the OC-3 frame (for example, the STS-3/OC-3 frame has a rate of 3 x 51.84 Mb/s or 155.52 Mb/s).

The SONET frame format consists of 90 x 9 bytes and is divided into two main areas -- the synchronous payload envelope (SPE) and the transport overhead (TOH). The SPE contains the core data that the frame is transporting. The TOH contains the enhanced operations, administration, maintenance, and provisioning (OAM&P) information.

Synchronous Digital Hierarchy (SDH) provides the framing format required for ATM in Europe.

Site Manager: Framing Mode: page A-7

Enabling or Disabling Cell Payload Scrambling

Some ATM network equipment can exhibit sensitivity to certain bit patterns (for example, 101010... or 000000...). This sensitivity can cause problems in the ATM network. Setting the Scrambling feature to Enable (the default setting) randomizes the bit pattern in the cell payload sufficiently to guarantee cell synchronization.

Though some equipment may have the ability to operate with scrambling disabled, we recommend that you scramble the cell payload.

Note: ATM devices with different scrambling settings cannot communicate. For example, if you configure a router to enable scrambling, and configure a hub to disable scrambling, the router and hub cannot communicate.

Site Manager: Scrambling: page A-7

Enabling or Disabling Loopback

By default, Loopback is disabled on an ATM line. Enabling the Loopback feature initiates loopback diagnostic mode. In loopback mode, the router retransmits received data back to the sender over the same ATM line.

We recommend that you only enable Loopback when trying to diagnose a problem with the ATM line.

Site Manager: Loopback: page A-8

Defining ATM Cell Insertion

An ATM line is never idle. In the absence of user cells, the ATM framer device must fill the idle bandwidth. The Cell Insertion feature allows you to define whether you want unassigned cells (the default selection) or idle cells.

Idle cells are only visible at the physical layer. Unassigned cells are not only visible at the physical layer (which treats them as standard ATM cells), but also at the ATM layer.

Site Manager: Cell Insertion: page A-8

Modifying ATM ARE and Model 5780 ATM Router Line Details

This section describes how to edit the line details for ATM ARE link modules and Model 5780 ATM routers.

Enabling or Disabling the Line Driver

By default, when you create an ATM circuit, the line driver is enabled. You can enable or disable the line driver for the specific connector without having to remove the physical line from the ATM receptacle.

Site Manager: Enable: page A-9

Defining the Interface MTU

The MTU is the largest possible unit of data that the physical medium can transmit. By default, the interface allows an MTU size of 4608 octets. This value can handle most packet sizes. However, you can set this value anywhere from 1 through 9188 octets.

Site Manager: Interface MTU: page A-9

Enabling and Disabling the Data Path Function

This function specifies whether the router disables the interface between the driver and the higher-level software (the data path interface) when you disconnect the cable from the ATM interface.

By selecting Enable (the default), when you disconnect the cable from the interface, the router disables the data path interface after a time you specify. By disabling this function, the router does not disconnect the data path interface and continues to send information to the higher-level software.

Site Manager: Data Path Enable: page A-10

Specifying a Data Path Notify Timeout

When you enable the Data Path function, you must also specify how long you want the ATM router to wait before implementing this function. By default, when the state of the physical interface changes from operational to nonoperational, the timer waits 1 second before implementing the Data Path function. However, you can adjust this value from 0 through 3600 seconds.

Site Manager: Data Path Notify Timeout: page A-10

Enabling or Disabling SVC Inactivity Timeout

By enabling the SVC Inactivity Timeout function (the default), the router automatically disables any SVCs that have not received or transmitted any cells for the period of time you specify (see the section below).

If you disable the SVC inactivity timeout function, all SVCs on the line remain open until you close them by another method.

Site Manager: SVC Inactivity Timeout Enable: page A-11

Specifying an SVC Inactivity Timeout (In Seconds)

When you enable the SVC Inactivity Timeout function, you must also specify how long you want the ATM router to wait before implementing this function. By default, if the router does not receive or transmit any cells for 1200 seconds, the SVC Inactivity Timeout function activates. However, you can adjust this value from 60 through 3600 seconds.

Site Manager: SVC Inactivity Timeout (Secs): page A-11

Assigning the Framing Mode

You can assign the following transceiver framing modes to an ATM ARE ILI pair or a Model 5780 ATM router:

- SDH
- SONET
- CBIT
- M23
- G751
- G832

By default, the ATM line uses SONET framing. However, the framing mode you select depends on the interface type your device uses. Refer to the following table to match the appropriate framing mode(s) to the correct interface type.

Table 5-1. Determining an Appropriate Framing Mode

	Framing Modes You Can Use					
Interface Type	**SDH**	**SONET**	**CBIT**	**M23**	**G751**	**G832**
OC-3	✔	✔				
DS-3			✔	✔		
E3					✔	✔

Site Manager: Framing Mode: page A-11

Defining the Clocking Signal Source

You can specify either an internal (the default setting) or external clocking source for time signals. Internal uses the router clock; External uses the line clock.

Site Manager: Clocking Signal Source: page A-12

Specifying DS3 Line Build Out

On modules that use a DS3 interface, you can specify how the router conditions signals to migrate attenuation. Specify a short line (the default) for a line less than 225 ft long. Specify a long line for a line length of 225 ft or more.

Site Manager: DS3 Line Build Out: page A-12

Turning On and Off DS3 Scrambling

Some ATM network equipment can exhibit sensitivity to certain bit patterns (for example, 101010... or 000000...). This sensitivity can cause problems in the ATM network. Turning on the DS3 Scrambling feature (the default setting) randomizes the bit pattern in the cell payload sufficiently to guarantee cell synchronization.

Though some equipment may have the ability to operate with scrambling disabled, we recommend that you scramble the cell payload.

Note: ATM devices with different scrambling settings cannot communicate. For example, if you configure a router to enable scrambling, and configure a hub to disable scrambling, the router and hub cannot communicate.

Site Manager: DS3 Scrambling: page A-13

Where to Go Next

Use the following table to determine where you want to go next.

For information about	Go to
Starting ATM	Chapter 1
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General Classical IP over ATM information	Chapter 3
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Customizing a LAN emulation client	Chapter 8
Customizing signaling	Chapter 9
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Chapter 6
Customizing ATM Interfaces and Service Records

Setting the Interface Administrative State

By default, the ATM interface is operational (Up) when you create the circuit. However, you can set the administrative state to Up or Down at any time.

When the administrative state is Up, traffic can flow over the interface. When the administrative state is Down, traffic cannot flow over the interface.

Site Manager: Administrative State: page A-14

Enabling or Disabling Signaling on an Interface

By enabling ATM signaling (the default setting) you can configure switched features (for example, SVCs and LAN emulation) on the interface. If you do not intend to configure any switched features on the interface (that is, you want the interface to run only PVCs), disabling ATM signaling makes additional system resources available.

Site Manager: Enable ATM Signaling: page A-15

Autogenerating ATM Addresses

You can automatically generate the user part (suffix) of SVC ATM addresses. When autogenerating this portion of the ATM addresses, you can use either the ATM hardware MAC address or a MAC address override value as the endstation identifier.

Enabling or Disabling the Hardware MAC Address Feature

If enabled, the Hardware MAC Address feature uses the MAC address of the ATM interface when automatically generating the ATM address user part. Disabling this feature uses the MAC Address Override value (see below) when automatically generating the ATM address user part.

Note: If you disable the Hardware MAC Address feature, you must enter a MAC Address Override value.

Site Manager: Use Hardware MAC Address: page A-16

Entering a MAC Address Override Value

The MAC Address Override value redefines the hardware MAC address for the interface. It also defines the endstation identifier for the interface when automatically generating the user part (suffix) of an SVC ATM address.

Using the MAC Address Override parameter is very helpful when you want to "hot-swap" ATM link modules.

For example, when "hot-swapping" ATM link modules, you can enter the MAC address of the original ATM link module as the MAC Address Override value for the new ATM link module. This allows you to keep the information you have already configured on the existing ATM link module while maintaining the integrity of the existing client information on the network.

Site Manager: MAC Address Override: page A-17

Enabling or Disabling User Part Autogeneration

After deciding what endstation identifier information you want to use during user part autogeneration, you can also specify on what service records you want the autogeneration feature to run.

By default, when you add an SVC service record, the user part autogeneration feature is enabled. However, you can enable or disable this feature on an individual service record at any time.

Site Manager: User Part Autogeneration: page A-21

Assigning ATM Addresses

An ATM address is composed of a network prefix and a user part. Bay Networks routers using the autogeneration feature create the user part of the ATM address. The user part autogeneration feature combines the MAC address of the ATM interface and a unique selector byte to create unique addresses (Figure 6-1).

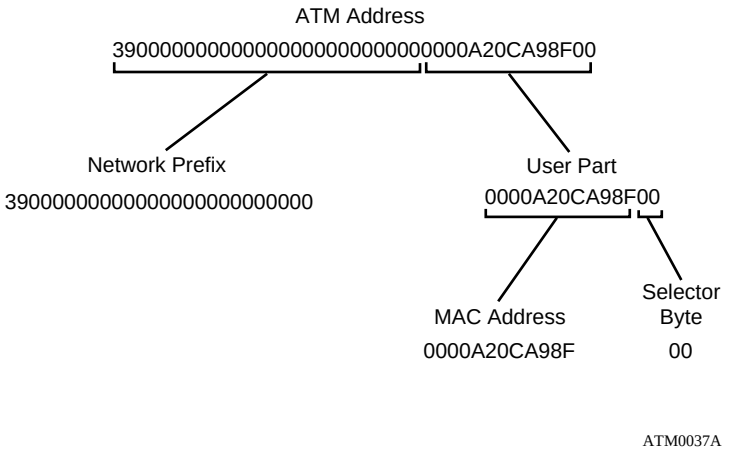

Figure 6-1. ATM Address Components

Entering an ATM Address Network Prefix

The ATM address network prefix specifies the ATM domain of which the service record is a part. This thirteen-byte portion of the ATM address can range between XX0000000000000000000000000 and XXFFFFFFFFFFFFFFFFFFFFFFF.

The XX byte must contain 39, 45, or 47. These values define the authority and format identifier (AFI). The AFI byte identifies the group responsible for allocating the prefix and the format the prefix uses. For more information about the AFI byte, refer to the ATM Forum UNI specification.

Entering a network prefix is optional. If you do not enter an ATM Address Network Prefix in the range specified above, the service record accepts the first prefix value that it receives from the switch.

Site Manager: ATM Addr Net Prefix (Optional): page A-22

Entering an ATM Address User Part

The ATM address user part (suffix) consists of a 6-byte endstation identifier and a 1-byte selector field. This 7-byte portion of the ATM address can range between 00000000000000 and FEFFFFFFFFFFFF.

You can either autogenerate this value (refer to “Autogenerating ATM Addresses,” earlier in this chapter) or you can enter the value manually.

Site Manager: ATM Addr User Part: page A-22

Enabling or Disabling a Service Record

By default, you enable a service record when you add it to the interface. However, you can enable or disable a specific service record at any time. Enable the service record to allow traffic to flow over the service record and any of its VCs. Disable the service record if you do not want traffic to flow over the service record or any of its VCs.

Site Manager: Enable/Disable: page A-20

Defining a Service Record

A service record is generally defined by the type of data encapsulation and virtual connection it uses. Table 6-1 shows the settings necessary to define a specific service record.

Table 6-1. Defining a Service Record

Service Record	Data Encapsulation Type	Virtual Connection Type
PVC	LLC/SNAP, NLPID, or NULL	PVC
Classical IP	LLC/SNAP or NULL	SVC
LANE	LANE	SVC

Assigning the Data Encapsulation Type

ATM allows you to choose from four data encapsulation types: LANE, LLC/SNAP, NLPID, and NULL. LANE is the default value when signaling is enabled on the interface. LLC/SNAP is the default value when signaling is disabled on the interface.

Each ATM device must encapsulate PDUs before sending them to the SAR sublayer. As a general rule, you can assign

- LLC/SNAP or NULL data encapsulation for service records containing PVCs
- LLC/SNAP data encapsulation for service records containing hybrid PVCs
- LANE encapsulation for service records containing SVCs over which you want to run LAN emulation
- LLC/SNAP or NULL for service records containing SVCs over which you want to run classical IP (RFC 1577)

Note: If you select NULL, the router interprets this as virtual, channel-based multiplexing, which is not supported for bridging.

For additional information about assigning data encapsulation, refer to Chapter 2.

Site Manager: Data Encapsulation Type: page A-20

Specifying a Virtual Connection Type

A service record can have either permanent virtual circuits (PVCs) or switched virtual circuits (SVCs) -- but not both. SVC is the default value when signaling is enabled on the interface. PVC is the default value when signaling is disabled on the interface.

For additional information about virtual connection types, refer to Chapter 2.

Site Manager: Virtual Connection Type: page A-21

Entering an Emulated LAN Name

Emulated LAN (ELAN) names are optional values (up to 128 alphanumeric characters) that provide administrative assistance when distinguishing among various ELANs. You can enter the name of an ELAN to which you want the LEC to join.

If you choose not to enter an ELAN name, the LECS assigns the LE client to an ELAN for this domain.

Site Manager: Emulated LAN Name: page A-23

Defining an Emulated LAN Type

The emulated LAN type indicates the data frame format that the LEC uses when it joins an emulated LAN. ATM allows you to choose from two emulated LAN types: Unspecified and IEEE8023.

Unspecified, the default value, indicates that you want the client to obtain the LAN type from the LAN emulation configuration server (LECS) when it joins an emulated LAN. Setting this value to IEEE8023 specifies that you want the client to join only Ethernet (IEEE 802.3) emulated LANs.

Site Manager: Emulated LAN Type: page A-24

Defining the MTU

The MTU is the largest possible unit of data that the service record can transmit. By default, the service record allows an MTU size of 4608 octets. This value can handle most packet sizes.

The MTU size is typically determined by the driver. However, you can override the driver default to accommodate connection to devices that require different MTU sizes.

You can set this value from 1 though 9188 octets.

Site Manager: MTU: page A-24

Note: For full compatibility with RFC 1577, you may have to specify an MTU size of 9188 bytes.

Where to Go Next

Use the following table to determine where you want to go next.

For information about	Go to
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Chapter 7
Customizing PVCs

Setting a VPI/VCI Pair

A virtual path is a set of virtual channels between a common source and destination. The virtual channels within a virtual path logically associate to a common identifier. This identifier is called the virtual path identifier (VPI) and is part of the cell header.

A virtual channel is a logical connection between two communicating ATM entities. Each virtual channel may carry a different protocol or traffic type. The virtual channel transports cells that have a common identifier. The identifier is called the virtual channel identifier (VCI) and is part of the cell header.

Note: ATM does not allow duplicate VPI/VCI pairs on the same physical interface (that is, on the same link module). However, duplicate VPI/VCI pairs can exist on different physical interfaces (that is, on different link modules).

Setting a VPI Number

The VPI number does not have a default setting. You must enter a valid VPI number for each PVC you create. This number identifies the virtual path of the PVC. The VPI is part of the cell header. The header can contain a maximum of 8 VPI bits for a UNI connection. This bit range allows for path identifiers from 0 through 255.

Site Manager: VPI Number: page A-25

Setting a VCI Number

The VCI number does not have a default setting. You must enter a valid VCI number for each PVC you create. This number identifies the virtual channel of the PVC. The VCI is part of the cell header. The header can contain a maximum of 16 VCI bits. This bit range allows for channel identifiers from 0 through 65535.

Site Manager: VCI Number: page A-26

Note: Following the recommendation of the ATM Forum, virtual channel identifiers from 0 through 31 are reserved for signaling and added functionality.

Designating a VC as Hybrid/Bridged

PVCs do not typically allow for bridging in nonmeshed environments. If your network combines bridging and routing over the same interface, you need to use the service record portion of each PVC for routing, while at the same time allow bridging to operate. To do this, you must define the PVC as a hybrid/bridged VC.

By default, a PVC does not operate as a hybrid/bridged VC. However, you can configure any PVC to operate as a hybrid/bridge VC.

Note: When you define a PVC as a hybrid/bridged VC, you can also configure additional Bridge, Spanning Tree, and NML protocol options. These protocols run on the PVC along with any protocols you defined in the ATM service record.

For more information on PVC access methods, including hybrid access, refer to “PVC Access Methods” in Chapter 2.

Site Manager: Hybrid/Bridged VC: page A-26

Assigning the Administrative State

By default, the PVC is operational (Up) when you add it to the service record. However, you can set the administrative state to Up or Down at any time.

When the administrative state is Up, traffic can flow over the PVC. When the administrative state is Down, traffic cannot flow over the PVC.

Site Manager: Administrative State: page A-27

Modifying ATM Traffic Parameters

The *ATM User-Network Interface Specification* defines several traffic parameters. These parameters help to prioritize and control the traffic on each VC.

How you modify your ATM traffic parameters depends on

- The characteristics (for example, maximum cell rate, average cell rate, burst size) of the individual connections that you want to set up
- The bit-rate method -- variable or available -- that the ATM ILI pair uses

You can change your ATM traffic parameters several times before deciding on a particular set. This section explains the different traffic parameters and provides some basic guidelines for customizing traffic parameters on an ATM PVC or ATM control SVC (that is, the signaling VC or ILMI VC).

Note: You do not need to manually configure traffic parameters for SVCs (as you must for PVCs and control VCs), because SVCs dynamically negotiate these parameters before transferring data.

Setting the PCR

The PCR specifies the upper traffic limit, in cells/second, that the ATM connection can submit.

How you set the PCR depends on

- The optical transmission rate of your ATM device
- The amount of traffic you expect on a particular VC

- The rate you desire for each VC

When setting the PCR, keep the following in mind:

- Each VC can have its own PCR.
- The PCR cannot exceed the maximum rate for the physical media. For example, you cannot exceed 149.76 Mb/s for a SONET/SDH line.
- The PCR specifies the desired rate for the attached physical media (that is, SONET/SDH, DS-3, or E-3). It does not specify the rate for the ATM network as a whole. For example, you can specify a full 149.76 Mb/s for each PVC or control VC on a SONET/SDH connection. However, if the VC ultimately connects to a lower-speed link (for example, T1 or E1), your PCR is limited to the maximum rate of that media.
- ATM FRE2 ILI pairs require a minimum PCR value of 300 cells/s. VCs may fail to operate with PCR values less than 300 cells/s.
- ATM ARE ILI pairs require a minimum PCR value of 128 cells/s. VCs may fail to operate with PCR values less than 128 cells/s.
- The E-3 framing mode setting affects the maximum PCR setting.

By default, the PCR is set to 2358 cells/s. Table 7-1 lists the valid ranges for each Bay Networks ATM router.

Table 7-1. Valid PCR Ranges

ATM Routers	Range (Cells/s)
ATM FRE2 OC-3 SONET/SDH ILI pairs	300 through 365566
ATM ARE OC-3 SONET/SDH ILI pairs	128 through 353207
Model 5780	128 through 353207
ATM ARE DS-3 ILI pairs	128 through 96000
ATM ARE E-3 ILI pairs; G832 Framing Mode	128 through 80000
ATM ARE E-3 ILI pairs; G751 Framing Mode	128 through 72000

For additional information about traffic parameters, refer to “ATM Traffic Parameters” in Chapter 2.

Site Manager: Xmit Peak Cell Rate (cells/s): page A-27

Setting the SCR

For ATM FRE2 ILI pairs, the SCR is the upper bound on the conforming average rate of an individual PVC or control VC. In this definition, *average rate* is the number of cells transmitted over the link divided by the duration of the connection. The *duration of the connection* equals the total amount of time it takes from connection setup to connection release.

The SCR allows you to define future cell flow on a PVC or control VC in greater detail than by just using the PCR. For ATM FRE2 ILI pairs, the SCR controls the rate over time -- not at a specific instant of time -- and can help you more efficiently use your network resources. In other words, the SCR allows sufficient bandwidth for operation, but does not allow a bandwidth as high as the PCR.

For ATM ARE ILI pairs and Model 5780 ATM routers, the SCR value maps directly to a minimum cell rate (MCR) value. In other words, when you configure the SCR on one of these devices, you actually configure the MCR. Instead of defining the upper bound of an average rate, like the SCR, the MCR defines the minimum amount of guaranteed bandwidth allowed for PVCs and control VCs on the ATM line.

The MCR (that is, SCR) not only controls the rate over time, it guarantees this rate. In other words, the SCR provides sufficient bandwidth for SVC operation but, at the same time, guarantees the bandwidth for PVCs and control VCs on the ATM line.

When setting the SCR for ATM FRE2 ILI pairs, keep the following in mind:

- The SCR is essentially a future average. By setting the SCR you are specifying the cell rate, over time, to which you want the VC to conform.
- To be useful, the SCR must not exceed the PCR.
- If you know the user average rate, set the SCR about 10 percent higher than this value.
- ATM FRE2 ILI pairs require a minimum SCR value of 300 cells/s. PVCs may fail to operate with SCR values less than 300 cells/s.

When setting the SCR for ATM ARE ILI pairs and Model 5780 ATM routers, keep the following in mind:

- The SCR maps directly to the MCR.

- The MCR provides guaranteed bandwidth for PVCs and control VCs while allowing sufficient bandwidth for SVCs to operate.
- To be useful, the SCR must not exceed the PCR.
- If you know the user average rate, set the SCR about 10 percent higher than this value.
- ATM ARE ILI pairs and Model 5780 ATM routers require a minimum SCR value of 128 cells/s. VCs may fail to operate with SCR values less than 128 cells/s.
- ATM ARE ILI pairs and Model 5780 ATM routers allow you to enter an SCR value of 0. Entering 0 for the SCR turns off this function and specifies that the ATM router use “best effort” for SCR.
- The E-3 framing mode setting affects the maximum SCR setting.

By default, the SCR is set to 2358 cells/s. Table 7-2 lists the valid ranges for each Bay Networks ATM router.

Table 7-2. Valid SCR Ranges

ATM Routers	Range (Cells/s)
ATM FRE2 OC-3 SONET/SDH ILI pairs	300 through 365566
ATM ARE OC-3 SONET/SDH ILI pairs	0, 128 through 353207
Model 5780	0, 128 through 353207
ATM ARE DS-3 ILI pairs	0, 128 through 96000
ATM ARE E-3 ILI pairs; G832 Framing Mode	0, 128 through 80000
ATM ARE E-3 ILI pairs; G751 Framing Mode	0, 128 through 72000

For additional information about traffic parameters, refer to “ATM Traffic Parameters” in Chapter 2.

Site Manager: Xmit Sustainable Cell Rate (cells/s): page A-28

Setting the MBS

For ATM FRE2 ILI pairs, the MBS is the maximum length of a cell stream allowed on a particular VC. The MBS specifies the maximum number of sequential cells allowed on a VC before that VC must relinquish bandwidth to other VCs waiting to transmit. This burst occurs at or close to the Peak Cell Rate.

When you set the MBS, we suggest that you select a value larger than the largest packet your PVC or control VC can transmit (that is, the Maximum AAL common part convergence sublayer [CPCS] Transmit service data unit [SDU] size). For example, if your VC accepts packets that are less than 2358 bytes long (PVC default), set your MBS value between 45 and 50 cells.

Note: ATM ARE ILI pairs ignore the maximum burst size.

By default, the MBS is set to 40 cells. However, you can adjust this value from 1 through 65535 cells.

As a guideline, use this formula to determine your MBS value:

$$\frac{\textit{Maximum Packet Size (in bytes)}}{\textit{48 bytes/cell}} = \textit{MBS value (in cells)}$$

for example:

$$\frac{\textit{4608 bytes (default)}}{\textit{48 bytes/cell}} = \textit{96 cells}$$

ATM0016A

For additional information about traffic parameters, refer to “ATM Traffic Parameters” in Chapter 2.

Site Manager: Xmit Burst Size (cells): page A-30

Modifying the Maximum AAL CPCS SDU Size

The maximum AAL CPCS SDU value defines the maximum packet size you intend the VC to transmit or receive.

Setting the Transmit SDU Size

We suggest that you accept the default value of 4608 bytes for maximum AAL CPCS SDU size that the VC supports in the transmit direction. Most packet sizes fall well within this limit. However, you can set this value from 1 through 65535 bytes.

Site Manager: Maximum AAL CPCS Transmit SDU Size: page A-30

Setting the Receive SDU Size

We suggest that you accept the default value of 4608 bytes for maximum AAL CPCS SDU size that the VC supports in the receive direction. Most packet sizes fall well within this limit. However, you can set this value from 1 through 65535 bytes.

Site Manager: Maximum AAL CPCS Receive SDU Size: page A-31

Assigning a Data Encapsulation Type

You can choose either LLC/SNAP (the default value) or NULL data encapsulation to operate on the PVC. Assigning the data encapsulation type on the PVC level overrides the encapsulation type selected on the service record level.

Note: If you select NULL, the router interprets this as virtual, channel-based multiplexing, which is not supported for bridging.

For additional information about assigning data encapsulation, refer to Chapter 2.

Site Manager: Data Encapsulation Type: page A-31

Where to Go Next

Use the following table to determine where you want to go next.

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Customizing an ATM interface or service record	Chapter 6
Customizing a LAN emulation client	Chapter 8
Customizing signaling	Chapter 9
Customizing ILMI	Chapter 10
Customizing signaling and ILMI control VCs	Chapter 11
Customizing SAAL	Chapter 12
Accessing Site Manager parameters	Appendix A
Site Manager defaults	Appendix B
ATM log files	Appendix C

Chapter 8
Customizing LAN Emulation Clients

Today's networks contain a vast amount of existing LAN application software. LANE provides a way to accommodate this software while taking advantage of ATM technology. In other words, LANE allows the router to connect to the ATM network while LAN application software continues to operate as if it were running on a traditional LAN.

Bay Networks ATM routers support LANE functions as defined in the ATM Forum *LAN Emulation Over ATM* specification (Version 1.0).

Enabling or Disabling LANE

By default, LANE is enabled on a service record when you assign LANE data encapsulation to that service record. However, you can enable or disable LANE on a service record at any time.

Site Manager: Enable: page A-32

Defining a LEC

To fully define a LEC, you can specify

- An owner for the LEC (optional)
- The name of the emulated LAN you want the LEC to join (optional)
- A LES ATM address (automatic)

Specifying an Owner

Specifying a LEC owner is optional. This entry (up to 128 alphanumeric characters) provides administrative assistance when distinguishing between various other LECs.

Site Manager: Owner: page A-32

Entering an ELAN Name

ELAN names are optional values (up to 128 alphanumeric characters) that provide administrative assistance when distinguishing among various ELANs. You can enter the name of an ELAN to which you want the LEC to join.

If you choose not to enter an ELAN name, the LECS assigns the LE client to an ELAN for this domain.

Site Manager: Emulated LAN Name: page A-34

Entering a LES ATM Address

LE clients use the LES to establish the Control Direct VCC. The LEC must know the LES address to obtain this information before it can join an emulated LAN.

If you select Manual configuration mode (see following), enter the LES address. If you select Automatic configuration mode, you do not have to enter this address (the LE client receives the LES from the LAN emulation configuration server).

Site Manager: LE Server ATM Address: page A-34

Selecting a Configuration Mode

You can select a LEC to run in Automatic or Manual mode. In Automatic mode (the default selection), the LE client uses the LES address it receives from the LAN emulation configuration server (LECS) to join an ELAN. In Manual mode, you must enter the LES address and the LAN type (see the following section) of the ELAN you want the LE client to join.

Site Manager: Configuration Mode: page A-32

Assigning an Emulated LAN Type

You can assign a LE client to either join whatever ELAN the LECS assigns it to or allow it to join only Ethernet ELANs. When you assign an unspecified LAN type (the default selection), the client obtains the LAN type from the LECS when it joins an ELAN. When you assign IEEE8023, the client joins only Ethernet ELANs.

Note: If you select Manual configuration mode (refer to the preceding section) you must specify a LEC LAN type.

Site Manager: Emulated LAN Type: page A-33

Setting the Maximum Data Frame Size

The maximum data frame size is the largest frame that the client can

- Send on the Multicast Send VCC
- Receive on the Multicast Forward VCC
- Send and receive on Data Direct VCCs

When you accept the default, Unspecified, the LEC obtains the maximum data frame size when it joins an ELAN. However, you can limit the maximum data frame size that the LEC can transmit to 1516 octets.

Note: Selecting Manual configuration mode automatically sets the Maximum Data Frame Size to 1516.

Site Manager: Maximum Data Frame Size: page A-33

Controlling Unknown Frame Distribution

A frame is considered unknown when the LE client does not recognize the destination MAC address. In this case, the unknown frame goes to the BUS for distribution. Setting unknown frame variables helps to limit unknown frame traffic to the BUS.

To control the distribution of unknown frames, you must

- Set the maximum number of unknown frames the LEC can send
- Specify the amount of time allowed to send the unknown frames to the BUS

Setting a Maximum Unknown Frame Count

You can limit the number of unknown frames a LEC sends to the BUS. By default, a LEC can send only one unknown frame to the BUS within a specified unknown frame time (see the following section). However, you can allow a LEC to send up to 10 unknown frames to the BUS within the maximum unknown frame time.

Site Manager: Max Unknown Frame Count: page A-35

Specifying a Maximum Unknown Frame Time

The unknown frame time specifies the maximum amount of time allowed to send the number of unknown frames defined in the Unknown Frame Count (see the previous section). By default, the LEC can send the allowable number of unknown frames for a maximum of 1 second.

This means that (using the default values) a LEC can send up to one unknown frame within 1 second for any given MAC address without having to initiate the address resolution protocol to resolve that MAC address. However, you can specify up to 60 seconds for the maximum unknown frame time.

Site Manager: Max Unknown Frame Time: page A-36

Modifying LANE Timers and Retry Counters

You can modify several timers and counters for each LEC. These timers and counters include the

- Control Timeout
- VCC Timeout Period
- Maximum Retry Count
- Aging Time
- Forward Delay Time
- Expected LE_ARP Response Time
- Path Switching Delay

Setting the Control Timeout

The Control Timeout defines the timeout period used for most request/response control frame interactions. The default timeout is 5 seconds, but you can set this value from 5 through 32767 seconds.

Site Manager: Control Timeout: page A-35

Enabling or Disabling the VCC Timeout Period

When you enable the VCC Timeout Period (the default setting), the LEC may release any unused Data Direct or Multicast Send VCCs after the VCC timeout period expires. The ATM drivers provide a VCC timeout period of 20 minutes. If you disable the VCC timeout period, the LEC does not release any unused Data Direct VCCs.

Site Manager: VCC Timeout Period Enable: page A-36

Setting the Maximum Retry Count

The Maximum Retry Count is the maximum number of times a LEC can retry an LE_ARP_REQUEST (following the original request) for any given frame MAC address. You can allow either one (the default) or two retries.

Site Manager: Max Retry Count: page A-37

Setting the Aging Time

The Aging Time defines the maximum amount of time that a LEC can maintain an entry in its LE ARP cache without having to verify the relationship of that entry.

By default, the LEC maintains entries for 300 seconds. However, you can set the aging time to a value from 10 through 300 seconds.

Site Manager: Aging Time: page A-37

Setting the Forward Delay Time

While there are no changes occurring in the network topology, the Forward Delay Time defines the maximum amount of time that a LEC can maintain an entry in its LE ARP cache without having to verify the relationship of that entry.

By default, the LEC maintains entries for 15 seconds, so long as the network topology does not change. However, you can set the Forward Delay Time to a value from 4 through 30 seconds.

Site Manager: Forward Delay Time: page A-37

Defining the Expected LE_ARP Response Time

The Expected LE_ARP Response Time defines the amount of time that the LEC expects an ARP request and ARP response cycle to take. The LEC uses this value during retries and verifications.

By default, the LEC expects an ARP request and ARP response cycle to take a maximum of 3 seconds. However, you can set the LE_ARP Response Time to a value from 1 through 30 seconds.

Site Manager: Expected LE_ARP Response Time: page A-38

Setting the Path Switching Delay

The Path Switching Delay defines the amount of time that the LEC waits after sending a frame over an old VCC before it switches to a new VCC (this applies to multicast and data direct VCCs).

You can use the Path Switching Delay to bypass the Flush protocol. When you disable the Flush protocol, the data for a specific MAC address automatically begins flowing over a new VC when the Path Switching Delay time elapses.

By default, the LEC waits a maximum of 6 seconds after sending a frame over an old VCC before it switches to a new VCC. However, you can set the Path Switching Delay to a value from 1 through 8 seconds.

Site Manager: Path Switching Delay: page A-38

Modifying Flush Protocol Variables

The Flush protocol ensures that data destined for a particular MAC address arrives in sequence. This means that once the LEC issues a Flush request, the Flush protocol drops any cells it receives for the particular MAC address until

- The LEC receives a Flush response for that MAC address
- The Flush timeout expires for that MAC address

If the client receives a flush response for the cell MAC address, the cells for this MAC address begin flowing over a new virtual circuit. However, if the flush timeout expires for this MAC address, the cells begin flowing to the BUS.

Enabling or Disabling the Flush Protocol

You can enable (the default selection) or disable the Flush protocol for any LEC.

When enabled, the Flush protocol drops cells with the current destination MAC address until the LEC receives a Flush response for that MAC address or the Flush Timeout expires (see the following section).

When disabled, cells containing the destination MAC address drop while waiting for the Path Switching Delay to time out. After the Path Switching Delay time elapses, the data automatically begins flowing over a new virtual circuit.

Site Manager: Flush Protocol: page A-39

Setting the Flush Timeout

The Flush Timeout defines the amount of time the LEC waits to receive a Flush response (after sending a Flush request) before it takes recovery action by switching back to the BUS.

By default, the LEC waits 4 seconds for a Flush response. However, you can set the Flush Timeout to a value from 1 through 4 seconds.

Site Manager: Flush Timeout: page A-38

Entering a LECS ATM Address

You can specify which LECS you want the LE client to use when opening a configuration VCC to the configuration service. Entering this ATM address is optional; if you do not enter an address, the LEC uses the well-known LECS ATM address to open a configuration VCC.

Site Manager: LE Config Server ATM Address: page A-39

Where to Go Next

Use the following table to determine where you want to go next.

For information about	Go to
Starting ATM	Chapter 1
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Chapter 9
Customizing Signaling

ATM signaling allows the router to dynamically establish, maintain, and clear a switched virtual connection at the UNI. Using a series of messages (as defined by the Q.2931 standard for signaling protocol [Figure 9-1]), the router

1. Assesses the availability of an ATM endpoint (device)
2. Establishes a connection with that device
3. Maintains that connection for the duration of data transfer
4. Clears the connection when the transfer is complete

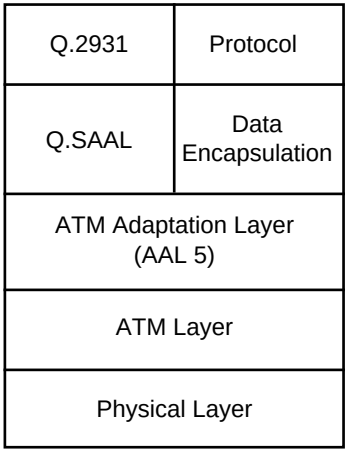

Figure 9-1. SVC/PVC Signaling Protocol Stack

Bay Networks ATM routers support ATM signaling functions as defined in the ATM Forum *ATM User-Network Interface* specification (Versions 3.0 and 3.1).

Enabling or Disabling Signaling

By default, signaling is enabled on an interface when you create the circuit. However, you can enable or disable signaling on an interface at any time.

Site Manager: Enable: page A-41

Note: Disabling ATM signaling on an interface automatically sets the data encapsulation type to LLC/SNAP and the virtual connection type to PVC for any new service records.

Assigning a Protocol Standard

The protocol standard specifies how the interface defines Service Specific Connection Oriented Protocol (SSCOP) frames. ATM Forum Version 3.0 and Version 3.1 methods of defining SSCOP frames are incompatible.

You must assign the same protocol standard for both the router interface and the switch. Accept the default, UNI_V30, if the switch uses ATM Forum UNI Version 3.0 to define SSCOP frames. Select UNI_V31 if the switch uses ATM Forum UNI Version 3.1 to define SSCOP frames.

Site Manager: Protocol Standard: page A-41

Specifying the Maximum Number of SVC Applications

You can specify the maximum number of SVC applications, or SAPs, that you want to operate on the circuit. The number of SAPs corresponds to the number of LANE or IP (RFC 1577) clients allowed for the circuit.

By default, you can have up to 20 SVC applications on the circuit. However, you can specify a value from 1 through 32767.

Site Manager: Max Number of SVC Applications: page A-42

Setting Connection Thresholds

Connection thresholds allow you to control how many point-to-point connections, point-to-multipoint connections, and parties in a multipoint connection that you want on the circuit at any given time.

Defining Maximum Point-to-Point Connections

By default, you can have up to 1000 simultaneous point-to-point connections on a circuit at any given time. However, you can specify a value from 0 through 32767 connections.

Site Manager: Max Point to Point Connections: page A-42

Defining Maximum Point-to-Multipoint Connections

By default, you can have up to 40 simultaneous point-to-multipoint connections on a circuit at any given time. However, you can specify a value from 0 through 32767 connections.

Site Manager: Max Point to Multipoint Connections: page A-42

Defining Maximum Parties in Multipoint Connections

By default, you can have one (1) party in each multipoint connection on a circuit at any given time. However, you can specify a value from 0 through 32767 parties.

Site Manager: Max Parties in Multipoint Connections: page A-43

Setting the Minimum Memory Threshold

The Minimum Memory Threshold defines the minimum percentage of buffer memory required to enable a new call. The default value is 20 percent, but you can specify a percentage from 10 percent through 100 percent (in increments of 10; for example, 10%, 20%, 30%, and so on).

Site Manager: Min Memory Threshold: page A-43

Setting Signaling Timers

You can set several different signaling timers. Table 9-1 show the timer defaults, ranges, and descriptions.

Table 9-1. Signaling Timer Descriptions

Name	Default	Range	Description
T303	4	1 through 24	Defines the Setup Sent timer value (in seconds). This timer begins when the circuit initiates a call/connection request by sending a SETUP message over the signaling VC. The Setup Sent timer stops when the circuit receives either a CONNECT message (indicating connection), CALL PROCEEDING message (indicating that the network received the SETUP message), or RELEASE COMPLETE message (indicating the rejection of the SETUP message) from the network. If the circuit does not receive one of these messages within the allotted time, it transmits the SETUP message a second time. If the circuit still does not receive a response, it clears the connection.
T308	30	1 through 180	Defines the Release Sent timer value (in seconds). This timer begins when the circuit sends a RELEASE message to initiate clearing of an SVC. Sending this RELEASE message places the network in the Release Request state. The Release Sent timer stops when the circuit receives either a RELEASE message (that is, both the circuit and the network sent RELEASE messages at the same time) or a RELEASE COMPLETE message from the network. If the timer expires before the circuit receives one of these messages, the circuit transmits the RELEASE message a second time. If the circuit still does not receive a response, the circuit releases the call reference and begins a restart procedure.

(continued)

Table 9-1. Signaling Timer Descriptions *(continued)*

Name	Default	Range	Description
T309	10	1 through 540	Defines the SAAL Data Link Connect timer value (in seconds). This timer begins when a Signaling AAL malfunction occurs. The SAAL Data Link Connect timer stops when the circuit reestablishes SAAL (that is, when the circuit sends an AAL-ESTABLISH-REQUEST and receives an AAL-ESTABLISH-CONFIRM message). If the timer expires before the circuit can reestablish SAAL, the circuit clears the connection.
T310	10	1 through 60	Defines the Call Proceeding Received timer value (in seconds). This timer begins when the circuit receives a CALL PROCEEDING message from the network. If the signaling does not receive a CONNECT or RELEASE message before this timer expires, it clears the connection for that virtual circuit.
T313	4	1 through 24	Defines the Connect Sent timer value (in seconds). This timer begins when the circuit sends a CONNECT message to the network. The Connect Sent timer stops when the circuit receives a CONNECT ACKNOWLEDGE message from the network (indicating the completion of the ATM connection for that interface). If the timer expires before the circuit receives a CONNECT ACKNOWLEDGE message, the circuit clears the connection.

(continued)

Table 9-1. Signaling Timer Descriptions *(continued)*

Name	Default	Range	Description
T316	120	1 through 720	Defines the Restart Request Sent on Interface timer value (in seconds). This timer begins when the circuit sends a RESTART message to the network. The circuit uses the RESTART message to return all VCs on the interface to the idle condition. The Restart Request Sent on Interface timer stops when the circuit receives a RESTART ACKNOWLEDGE message from the network. If the timer expires before the circuit receives a RESTART ACKNOWLEDGE message, the circuit can transmit as many RESTART messages as specified with the Num Restarts Permitted parameter (see “Defining Retransmissions” later in this chapter). If the circuit still does not receive a response, the circuit enters the Null state until the appropriate maintenance action is taken.
T316c	120	1 through 720	Defines the Restart Request Sent on Channel timer value (in seconds). This timer begins when the circuit sends a RESTART message to the network. The circuit uses the RESTART message to return this individual VC on the interface to the idle condition. The Restart Request Sent on Channel timer stops when the circuit receives a RESTART ACKNOWLEDGE message from the network. If the timer expires before the circuit receives a RESTART ACKNOWLEDGE message, the circuit can transmit as many RESTART messages as specified with the Num Restarts Permitted parameter (see “Defining Retransmissions” later in this chapter). If the circuit still does not receive a response, the circuit enters the Null state until the appropriate maintenance action is taken.

(continued)

Table 9-1. Signaling Timer Descriptions *(continued)*

Name	Default	Range	Description
T322	4	1 through 24	Defines the Status Enquiry Sent timer value (in seconds). This timer begins when the circuit sends a STATUS ENQUIRY message to the network. This message checks the validity of a call by requesting the call state (that is, the state of an active call, the state of a call in progress, or the Null state if the call reference does not relate to an active call or a call in progress). The Status Enquiry Sent timer stops when the circuit receives a STATUS message from the network. If the timer expires before the circuit receives a STATUS message, the circuit can transmit as many STATUS ENQUIRY messages as specified with the Num Stat Enquiries Permitted parameter (see “Defining Retransmissions” later in this chapter). If the circuit still does not receive a response, the circuit clears the call.
TDisc	4	1 through 180	Defines the SAAL Data Link Disconnect timer value (in seconds). This internal timer alerts upper layers that the link is down. The timer begins if the entire link goes down for any reason. When the link goes down, the SAAL layer sends a DISCONNECT REQUEST message to the upper-layer application manager. The SAAL layer sends a disconnect request every time the SAAL Data Link Disconnect timer expires and continues to send this message until the link becomes operational.

(continued)

Table 9-1. Signaling Timer Descriptions *(continued)*

Name	Default	Range	Description
T398	4	1 through 24	Defines the Drop Party Sent timer value (in seconds). This timer applies to multipoint connections only and begins when the circuit sends a DROP PARTY message to a party (the receiver of the message) on the network. The Drop Party Sent timer stops when the circuit receives a DROP PARTY ACKNOWLEDGE message (indicating that the endpoint used for the party has been released), or a RELEASE message (indicating that the endpoint used for the party has been released and there are no remaining parties).
T399	14	1 through 84	Defines the Add Party Sent timer value (in seconds). This timer applies to multipoint connections only and begins when the circuit sends an ADD PARTY message to a party (the receiver of the message) on the network. The Add Party Sent timer stops when the circuit receives an ADD PARTY ACKNOWLEDGE message (indicating the connection to the party), ADD PARTY REJECT message (indicating the inability to add the party), or a RELEASE message (indicating the inability to add the party and the absence of any remaining parties). If the timer expires before the circuit receives an ADD PARTY ACKNOWLEDGE, ADD PARTY REJECT, or RELEASE message, the circuit clears the party.

Site Manager: T303: page A-44
Site Manager: T308: page A-45
Site Manager: T309: page A-45
Site Manager: T310: page A-46
Site Manager: T313: page A-46
Site Manager: T316: page A-47
Site Manager: T316c: page A-48
Site Manager: T322: page A-49
Site Manager: TDisc: page A-49
Site Manager: T398: page A-50
Site Manager: T399: page A-50

Defining Retransmissions

The ATM circuit can retransmit a number of RESTART and STATUS ENQUIRY messages before it considers the link down. You can control how many of these messages the circuit retransmits.

Setting the Number of Allowable Restart Messages

By default, the circuit can retransmit three (3) RESTART messages before it considers the link down. However, you can set the number of RESTART messages that the circuit can send to a value from 1 through 100.

Site Manager: Num Restarts ReXmitted: page A-51

Setting the Number of Allowable Status Enquiries

By default, the circuit can retransmit three (3) STATUS ENQUIRY messages before it considers the link down. However, you can set the number of STATUS ENQUIRY messages that the circuit can send to a value from 1 through 100.

Site Manager: Num Stat Enquiries ReXmitted: page A-51

Pacing Calls

You can define how the circuit paces its calls. By default, the circuit transmits up to two (2) calls per second. However, you can set this value from 0 through 2147483647 calls per second.

Site Manager: Num Messages/Sec for Call Pacing: page A-51

Where to Go Next

Use the following table to determine where you want to go next.

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Customizing a LAN emulation client	Chapter 8
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Chapter 10
Customizing ILMI

In a switched ATM network, an ATM device must register its ATM address with an ATM switch. The router uses ILMI to send and receive initial registration data to and from an ATM switch. Using a series of ILMI SNMP **set** and **get** commands, the router

1. Initializes its ATM address table for the interface (the switch also initializes its address table for the interface)
2. Receives the ATM Address Network Prefix from the switch
3. Combines this Network Prefix with its own User Part (suffix)
4. Transmits the entire address to the switch

Enabling or Disabling ILMI

By default, ILMI is enabled on an interface when you create the circuit. However, you can enable or disable ILMI on an interface at any time.

Site Manager: Enable: page A-53

Modifying ILMI Timers and Retry Counters

You can modify several timers and counters for ILMI. These timers and counters include the

- ILMI Get Timer and Retry Count
- ILMI Get Next Timer and Retry Count
- ILMI Set Timer and Retry Count

Setting the ILMI Get Timer

The ILMI Get Request timer defines the amount of time allowed for the circuit to receive a GET_RESPONSE message after sending a GET_REQUEST message. By default, the circuit waits 3 seconds for a response. However, you can set this timer to a value from 1 through 120 seconds.

Site Manager: ILMI Get Timer: page A-54

Setting the ILMI Get Retry Count

The ILMI Get Retry Count specifies the number of times the circuit can retransmit the ILMI GET_REQUEST message before it considers the link down. By default, the circuit can retransmit three (3) ILMI GET_REQUEST messages. However, you can set the number of retries to a value from 1 through 100.

Site Manager: ILMI Get Retry Count: page A-54

Setting the ILMI Get Next Timer

The ILMI Get Next Request timer defines the amount of time allowed for the circuit to receive a GET_NEXT_RESPONSE message after sending a GET_NEXT_REQUEST message. By default, the circuit waits 3 seconds for a response. However, you can set this timer to a value from 1 through 120 seconds.

Site Manager: ILMI Get Next Timer: page A-55

Setting the ILMI Get Next Retry Count

The ILMI Get Next Retry Count specifies the number of times the circuit can retransmit the ILMI GET_NEXT_REQUEST message before it considers the link down. By default, the circuit can retransmit three (3) ILMI GET_NEXT_REQUEST messages. However, you can set the number of retries to a value from 1 through 100.

Site Manager: ILMI Get Next Retry Count: page A-55

Setting the ILMI Set Timer

The ILMI Set Request timer defines the amount of time allowed for the circuit to receive a SET_RESPONSE message after sending a SET_REQUEST message. By default, the circuit waits 3 seconds for a response. However, you can set this timer to a value from 1 through 120 seconds.

Site Manager: ILMI Set Timer: page A-55

Setting the ILMI Set Retry Count

The ILMI Set Retry Count specifies the number of times the circuit can retransmit the ILMI SET_REQUEST message before it considers the link down. By default, the circuit can retransmit three (3) ILMI SET_REQUEST messages. However, you can set the number of retries to a value from 1 through 100.

Site Manager: ILMI Set Retry Count: page A-56

Where to Go Next

Use the following table to determine where you want to go next.

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Chapter 11
Customizing Signaling and ILMI Control VCs

The signaling VC and the ILMI VC are reserved. These VCs remain in an operational state as long as signaling is enabled on the ATM interface. Because most ATM devices use these VPI/VCI pairs for signaling, we recommend that you not change these values. However, you may want to redefine the signaling and ILMI control VCs for your specific network.

Redefining the Signaling Control VC

The signaling VC is a dedicated VPI/VCI pair reserved for signaling messages. Having a permanent virtual circuit defined for signaling allows the ATM router to obtain necessary information about its signaling environment and properly negotiate the values it must use with other devices on the ATM network.

Changing the Signaling VPI Number

By default, the virtual path identifier (VPI) for the signaling control VC is 0. However, you can change the VPI number from 0 through 255.

Site Manager: VPI: page A-43

Changing the Signaling VCI Number

By default, the virtual channel identifier (VCI) for the signaling control VC is 5. However, you can change the VCI number from 1 through 65535.

Site Manager: VCI: page A-44

Redefining the ILMI Control VC

The ILMI control VC is a dedicated VPI/VCI pair reserved for ILMI messages. Having a permanent virtual circuit defined for ILMI allows the ATM router to send and receive initial registration data to and from an ATM switch.

Changing the ILMI VPI Number

By default, the virtual path identifier (VPI) for the ILMI control VC is 0. However, you can change the VPI number from 0 through 255.

Site Manager: ILMI VPI: page A-53

Changing the ILMI VCI Number

By default, the virtual channel identifier (VCI) for the ILMI control VC is 16. However, you can change the VCI number from 1 through 65535.

Site Manager: ILMI VCI: page A-54

Modifying Control VC Traffic Parameters

You can modify the following traffic parameters for both the signaling and the ILMI control VCs:

- Peak Cell Rate
- Sustainable Cell Rate
- Maximum Burst Size

Setting the PCR

The PCR specifies the upper traffic limit, in cells/second, that the ATM connection can submit.

How you set the PCR depends on

- The optical transmission rate of your ATM device
- The amount of traffic you expect on a particular VC

- The rate you desire for each VC

When setting the PCR, keep the following in mind:

- Each VC can have its own PCR.
- The PCR cannot exceed the maximum rate for the physical media. For example, you cannot exceed 149.76 Mb/s for a SONET/SDH line.
- The PCR specifies the desired rate for the attached physical media (that is, SONET/SDH, DS-3, or E-3). It does not specify the rate for the ATM network as a whole. For example, you can specify a full 149.76 Mb/s for each PVC or Control VC on a SONET/SDH connection. However, if the VC ultimately connects to a lower-speed link (for example, T1 or E1), your PCR is limited to the maximum rate of that media.
- ATM FRE2 ILI pairs require a minimum PCR value of 300 cells/s. VCs may fail to operate with PCR values less than 300 cells/s.
- ATM ARE ILI pairs require a minimum PCR value of 128 cells/s. VCs may fail to operate with PCR values less than 128 cells/s.
- The E-3 framing mode setting affects the maximum PCR setting.

By default, the peak cell rate is set to 4716 cells/s. Table 11-1 lists the valid ranges for each Bay Networks ATM router.

Table 11-1. Valid PCR Ranges

ATM Router	Range (Cells/s)
ATM FRE2 OC-3 SONET/SDH ILI pairs	300 through 365566
ATM ARE OC-3 SONET/SDH ILI pairs	128 through 353207
Model 5780	128 through 353207
ATM ARE DS-3 ILI pairs	128 through 96000
ATM ARE E-3 ILI pairs; G832 Framing Mode	128 through 80000
ATM ARE E-3 ILI pairs; G751 Framing Mode	128 through 72000

For additional information about traffic parameters, refer to “ATM Traffic Parameters” in Chapter 2.

Site Manager: Xmit Peak Cell Rate (cells/s): page A-56

Setting the SCR

For ATM FRE2 ILI pairs, the SCR is the upper bound on the conforming average rate of an individual PVC or control VC. In this definition, *average rate* is the number of cells transmitted over the link divided by the duration of the connection. The *duration of the connection* equals the total amount of time it takes from connection setup to connection release.

The SCR allows you to define future cell flow on a PVC or control VC in greater detail than by just using the PCR. For ATM FRE2 ILI pairs, the SCR controls the rate over time -- not at a specific instant of time -- and can help you more efficiently use your network resources. In other words, the SCR allows sufficient bandwidth for operation, but does not allow a bandwidth as high as the PCR.

For ATM ARE ILI pairs and Model 5780 ATM routers, the SCR value maps directly to a MCR value. In other words, when you configure the SCR on one of these devices, you actually configure the MCR. Instead of defining the upper bound of an average rate, like the SCR, the MCR defines the minimum amount of guaranteed bandwidth allowed for PVCs and Control VCs on the ATM line.

The MCR (that is, SCR) not only controls the rate over time, it guarantees this rate. In other words, the SCR provides sufficient bandwidth for SVC operation but, at the same time, guarantees the bandwidth for PVCs and control VCs on the ATM line.

When setting the SCR for ATM FRE2 ILI pairs, keep the following in mind:

- The SCR is essentially a future average. By setting the SCR you are specifying the cell rate, over time, to which you want the VC to conform.
- To be useful, the SCR must not exceed the PCR.
- If you know the user average rate, set the SCR about 10 percent higher than this value.
- ATM FRE2 ILI pairs require a minimum SCR value of 300 cells/s. PVCs may fail to operate with SCR values less than 300 cells/s.

When setting the SCR for ATM ARE ILI pairs and Model 5780 ATM routers, keep the following in mind:

- The SCR maps directly to the MCR.
- The MCR provides guaranteed bandwidth for PVCs and control VCs while allowing sufficient bandwidth for SVCs to operate.

- To be useful, the SCR must not exceed the PCR.
- If you know the user average rate, set the SCR about 10 percent higher than this value.
- ATM ARE ILI pairs and Model 5780 ATM routers require a minimum SCR value of 128 cells/s. VCs may fail to operate with SCR values less than 128 cells/s.
- ATM ARE ILI pairs and Model 5780 ATM routers allow you to enter an SCR value of 0. Entering 0 for the SCR turns off this function and specifies that the ATM router use “best effort” for SCR.
- The E-3 framing mode setting affects the maximum SCR setting.

By default, the SCR is set to 4716 cells/s. Table 11-2 lists the valid ranges for each Bay Networks ATM router.

Table 11-2. Valid SCR Ranges

ATM Router	Range (Cells/s)
ATM FRE2 OC-3 SONET/SDH ILI pairs	300 through 365566
ATM ARE OC-3 SONET/SDH ILI pairs	0, 128 through 353207
Model 5780	0, 128 through 353207
ATM ARE DS-3 ILI pairs	0, 128 through 96000
ATM ARE E-3 ILI pairs; G832 Framing Mode	0, 128 through 80000
ATM ARE E-3 ILI pairs; G751 Framing Mode	0, 128 through 72000

For additional information about traffic parameters, refer to “ATM Traffic Parameters” in Chapter 2.

Site Manager: Xmit Sustainable Cell Rate (cells/s): page A-57

Setting the MBS

For ATM FRE2 ILI pairs, the MBS is the maximum length of a cell stream allowed on a particular VC. The MBS specifies the maximum number of sequential cells allowed on a VC before that VC must relinquish bandwidth to other VCs waiting to transmit. This burst occurs at or close to the Peak Cell Rate.

When setting the MBS, we suggest that you select a value larger than the largest packet your PVC or Control VC can transmit (that is, the Maximum AAL CPCS Transmit SDU size). For example, if your VC accepts packets that are less than 2358 bytes long (PVC default), set your MBS value between 45 and 50 cells.

Note: ATM ARE ILI pairs ignore the maximum burst size.

By default, the MBS is set to 40 cells. However, you can adjust this value from 1 through 65535 cells.

As a guideline, use this formula to determine your MBS value:

$$\frac{\textit{Maximum Packet Size (in bytes)}}{\textit{48 bytes/cell}} = \textit{MBS value (in cells)}$$

for example:

$$\frac{\textit{4608 bytes (default)}}{\textit{48 bytes/cell}} = \textit{96 cells}$$

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For additional information about traffic parameters, refer to “ATM Traffic Parameters” in Chapter 2.

Site Manager: Xmit Burst Size (cells): page A-59

Modifying the Maximum AAL CPCS SDU Size

The maximum AAL CPCS SDU value defines the maximum packet size you intend the control VC to transmit or receive.

Setting the Transmit SDU Size

We suggest that you accept the default value of 4608 bytes for maximum AAL CPCS SDU size that the control VC supports in the transmit direction. Most packet sizes fall well within this limit. However, you can set this value from 1 through 65535 bytes.

Site Manager: Maximum AAL CPCS Transmit SDU Size: page A-59

Setting the Receive SDU Size

We suggest that you accept the default value of 4608 bytes for maximum AAL CPCS SDU size that the control VC supports in the receive direction. Most packet sizes fall well within this limit. However, you can set this value from 1 through 65535 bytes.

Site Manager: Maximum AAL CPCS Receive SDU Size: page A-60

Where to Go Next

Use the following table to determine where you want to go next.

For information about	Go to
Starting ATM	Chapter 1
General ATM information	Chapter 2
General Classical IP over ATM information	Chapter 3
General LAN emulation information	Chapter 4
Customizing an ATM line	Chapter 5
Customizing an ATM interface or service record	Chapter 6
Customizing PVCs	Chapter 7
Customizing a LAN emulation client	Chapter 8
Customizing signaling	Chapter 9
Customizing ILMI	Chapter 10
Customizing SAAL	Chapter 12
Accessing Site Manager parameters	Appendix A
Site Manager defaults	Appendix B
ATM log files	Appendix C

Chapter 12
Customizing SAAL

As defined by the ATM Forum, the SAAL resides between the ATM layer and the Q.2931 signaling layer. SAAL reliably transports signaling messages between peer Q.2931 entities over the ATM layer (Figure 12-1).

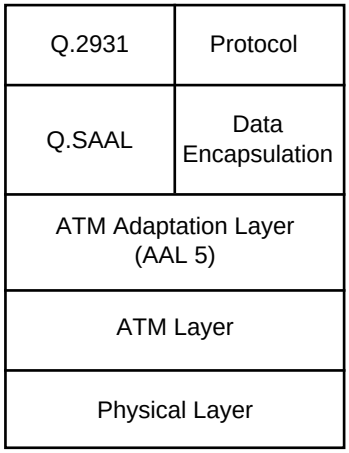

Figure 12-1. SVC/PVC Signaling Protocol Stack

Bay Networks routers support SAAL functions as defined in the ATM Forum *ATM User-Network Interface* specification (Versions 3.0 and 3.1).

Enabling or Disabling SAAL

By default, SAAL is enabled on an interface when you create the circuit. However, you can enable or disable signaling on an interface at any time.

Site Manager: Enable: page A-61

Defining the Link Connection Arbitration

Link Connection Arbitration defines whether SAAL initiates link connections (active, the default value) or waits for connections (passive).

Site Manager: Link Connection Arbitration: page A-62

Modifying SAAL Timers

You can set several different signaling timers. Table 12-1 gives the timer defaults, ranges, and descriptions.

Table 12-1. Signaling Timer Descriptions

Name	Default	Range	Description
Poll Timer	7	1 through 120	Defines the SSCOP Poll Timer value (in tenths of a second). This value sets the allowable time between POLL PDU transmissions. The poll timer ensures that the receiver continues to return a solicited status (STAT) PDU to the sender on a regular basis. The timely receipt of STAT PDUs restarts the poll timer and allows for more efficient transmission error recovery.
Keep Alive Timer	20	1 through 120	Defines the SSCOP Keep Alive Timer value (in tenths of a second). This value sets the allowable time between POLL PDU transmissions if there are no pending sequence data (SD) PDUs. The keep alive timer is generally greater than the poll timer and greater than the length of one round-trip delay.

(continued)

Table 12-1. Signaling Timer Descriptions *(continued)*

Name	Default	Range	Description
No Response Timer	70	1 through 120	Defines the SSCOP No Response Timer value (in tenths of a second). This value sets the allowable time between the receipt of STAT PDUs. So as not to interrupt the flow of data, the SSCOP does not require a reply to every POLL PDU. This can cause problems in detecting a broken connection. To alleviate this problem, the No Response timer runs parallel to the poll timer. If both the No Response timer and the poll timer expire, the SSCOP clears the connection. The No Response Timer value must equal at least the sum of the Keep Alive Timer plus the length of one round-trip delay.
Connection Control Timer	10	1 through 120	Defines the SSCOP Connection Control (CC) Timer value (in tenths of a second). This value sets the allowable time between the transmission of BGN, END, resynchronization (RS), and error recovery (ER) PDUs, as long as the sender has not received an acknowledgment to any of these PDUs. The CC Timer must equal at least the length of one round-trip delay.

Site Manager: Poll Timer: page A-62
Site Manager: Keep Alive Timer: page A-62
Site Manager: No Response Timer: page A-63
Site Manager: Connection Control Timer: page A-63

Defining PDU Values

SAAL allows you to define several SSCOP values that control PDUs.

Setting the SSCOP Maximum Connection Control Value

The SSCOP Maximum CC value sets the maximum number of times the sender can transmit a BGN, END, RS, or ER PDU.

By default, the sender can transmit up to four (4) of these messages. However, you can set this value from 1 through 20 messages.

Site Manager: Connection Control Timer: page A-63

Setting the SSCOP Maximum Poll Data Value

The SSCOP Maximum Poll Data value sets the maximum value of the poll data state variable before transmitting a POLL PDU. The poll data state variable increments upon transmission of a sequenced data (SD) PDU and resets to zero upon transmission of a POLL PDU.

By default, the Maximum Poll Data value sets the poll data state to 25. However, you can set this value from 1 through 120.

Site Manager: Max PD Before Poll: page A-64

Setting the SSCOP Maximum STAT PDU Value

The SSCOP Maximum STAT PDU value sets the maximum number of list elements allowed in a STAT PDU.

The sending device uses this value for segmentation purposes. When the number of list elements exceeds the Max STAT value, the STAT message segments. As a general rule, the default value, 67, causes the STAT PDU to fill six ATM cells using AAL 5.

You can set this value to odd integers from 3 through 119.

Site Manager: Max STAT PDU Elements: page A-64

Where to Go Next

Use the following table to determine where you want to go next.

For information about	Go to
Starting ATM	Chapter 1
General ATM information	Chapter 2
General Classical IP over ATM information	Chapter 3
General LAN emulation information	Chapter 4
Customizing an ATM line	Chapter 5
Customizing an ATM interface or service record	Chapter 6
Customizing PVCs	Chapter 7
Customizing a LAN emulation client	Chapter 8
Customizing signaling	Chapter 9
Customizing ILMI	Chapter 10
Customizing signaling and ILMI control VCs	Chapter 11
Accessing Site Manager parameters	Appendix A
Site Manager defaults	Appendix B
ATM log files	Appendix C

Appendix A
Site Manager Parameters

Once you enable an ATM circuit, you can use the Configuration Manager to edit ATM parameters. Many ATM parameters are interdependent; how you edit some parameters depends on how you set others.

Accessing ATM Parameters

You can access the same ATM parameters using either

- A window path
- A menu path

Both of these paths begin in the Configuration Manager window.

Although you can access the same ATM parameters using either path, the information provided by each access method is slightly different.

Note: The Protocols menu in the Configuration Manager does not provide access to ATM line parameters. Since line parameters are specific to an interface, you can access these parameters through a specific ATM interface.

Using the Window Path

The Edit ATM Connector window acts as a control access point for all ATM parameters. This window provides information specific to each individual ATM interface you select.

For any given interface, this window provides several attribute buttons. By clicking on any of these buttons, you can access and edit various parameters associated with that specific ATM interface (connector).

The Edit ATM Connector window separates the attribute buttons into the following categories:

- Lines
- Interfaces
- Service Records
- Signaling
- Signaling AAL (SAAL)
- ILMI

The Edit ATM Connector window also allows you to delete ATM from the interface entirely.

To open the Edit ATM Connector window:

1. **Click on an ATM link module interface (labeled ATM1) in the Configuration Manager window.**
   - — If you have not already enabled the interface, the Add Circuit window opens. Go to Chapter 1 to learn how to start ATM.
   - — If the interface is already enabled, the Edit ATM Connector window opens.
2. **Click on the desired attribute category.**

To learn more about how to navigate within each ATM attribute category, go to the section(s) in this chapter that describes that category.

To learn more about how to edit the different ATM parameters, go to the chapter that describes how to edit a specific attribute category.

Table A-1 lists each attribute category and its location.

Table A-1. Finding Attribute Categories

Attribute Category	Go to
Service [Record] Attributes	Chapter 6
Interface Attributes	Chapter 6
Line Attributes	Chapter 5
ATM Signaling	Chapter 9
SAAL	Chapter 12
ILMI	Chapter 10

Using the Menu Path

The Protocols menu in the Configuration Manager window provides global information about every ATM interface on the router. For example, if you configure four ATM link modules on the router, and you select Service Records from the Protocols menu, the ATM Service Records List window displays all of the service records that you have configured on the router.

To access an ATM attribute category window:

1. **Click on the Configuration Manager Protocols menu.**
2. **Click on ATM.**
3. **Click on the desired ATM attribute category in the menu.**

To learn more about how to navigate within each ATM attribute category, go to the section in this chapter that describes that category.

To learn more about how to edit the different ATM parameters, go to the chapter that describes how to edit a specific attribute category.

Table A-2 lists each attribute category and its location.

Table A-2. Finding Attribute Categories

Attribute Category	Go to
Service Records	Chapter 6
ATM Signaling	Chapter 9
SAAL	Chapter 12
ILMI	Chapter 10
Interfaces	Chapter 6

Note: The Protocols menu in the Configuration Manager does not provide access to ATM line parameters. Since line parameters are specific to an interface, you can access these parameters through a specific ATM interface.

ATM Line Parameter Descriptions

The type of ATM link module you use determines what line details you must edit. Figure A-1 shows the window sequence for the line attributes category.

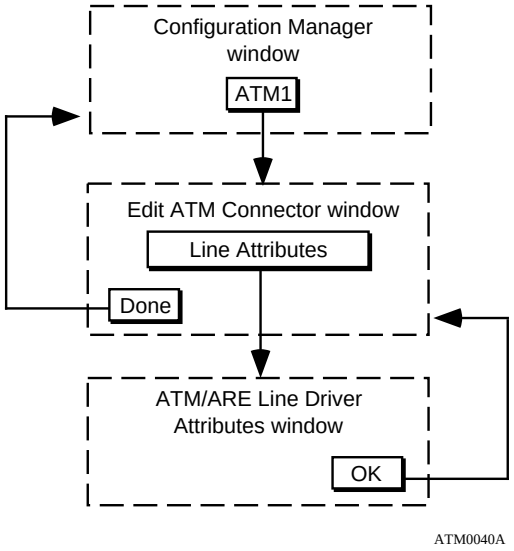

Figure A-1. Line Attributes Window Sequence

ATM FRE2 Line Details

This section describes how to edit the line details for ATM FRE2 link modules.

Parameter: Enable

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**

Default: Enable

Options: Enable | Disable

Function: Enables or disables the ATM circuit for this connector.

Instructions: Select Enable or Disable.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.2.1.1.2

Parameter: Data Path Notify

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**

Default: Enable

Options: Enable | Disable

Function: Enables or disables the Data Path Notify function, which disables the data path interface when the physical interface becomes nonoperational.

Instructions: Accept the default, Enable, if you want to disable the data path interface when the physical interface becomes nonoperational. Select Disable if you do not want the router to disable the data path interface when the physical interface becomes nonoperational.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.2.1.1.14

Parameter: Data Path Notify Timeout

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**

Default: 3 seconds

Options: 0 through 3600 seconds

Function: Specifies the number of seconds to wait before implementing the Data Path Notify function. Enabling Data Path Notify sets a timer to this value when the state of the physical interface changes from operational to nonoperational.

Instructions: Either accept the default value, 3 seconds, or specify a new value.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.2.1.1.15

Parameter: SVC Inactivity Timeout Enable

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**

Default: Enable

Options: Enable | Disable

Function: If you select Enable, the router disables any switched virtual circuit (SVC) on which the router receives or transmits no cells for the number of seconds you specify using the SVC Inactivity Timeout (Secs) parameter.If you select Disable, the router keeps SVCs open unless you close them by another method.

Instructions: Select Enable or Disable.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.2.1.1.28

Parameter: **SVC Inactivity Timeout (Secs)**

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**

Default: 1200 seconds

Options: 60 through 3600 seconds

Function: If the router receives or transmits no cells on an SVC for this number of seconds, it closes the SVC, providing that you set the SVC Inactivity Timeout Enable parameter to Enable.

Instructions: Enter an appropriate time, and be sure to set the SVC Inactivity Timeout Enable parameter to Enable.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.2.1.10

ATM FRE2 Physical Attributes

Edit ATM FRE2 physical attributes only when configuring a SONET OC-3 line.

Parameter: **Framing Mode**

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**

Default: SONET

Options: SDH | SONET

Function: Specifies either SDH or SONET framing mode.

Instructions: Select SDH or SONET.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.2.11.1.4

Parameter: **Scrambling**

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**

Default: Enable

Options: Enable | Disable

Function: Enabling scrambling randomizes cell payload sufficiently to guarantee cell synchronization. If you select Disable, cell synchronization problems may result.

Instructions: Select Enable or Disable.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.2.11.1.5

Parameter: Loopback

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**
Default: Disable
Options: Enable | Disable
Function: Specifies whether or not to use loopback diagnostic mode on this line. In loopback diagnostic mode, the router retransmits received data to the sender.
Instructions: Select Enable or Disable.
MIB Object ID: 1.3.6.1.4.1.18.3.4.23.2.11.1.7

Parameter: Cell Insertion

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**
Default: Unassigned
Options: Idle | Unassigned
Function: In the absence of user cells, the framer device fills idle bandwidth with either idle or unassigned cells.
Instructions: Select Idle or Unassigned.
MIB Object ID: 1.3.6.1.4.1.18.3.4.23.2.11.1.49

ATM ARE Line Details

This section describes how to edit the line details for ATM ARE link modules and the Model 5780 ATM router.

Parameter: Enable

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**
Default: Enable
Options: Enable | Disable
Function: Enables or disables the driver.
Instructions: Select Enable or Disable.
MIB Object ID: 1.3.6.1.4.1.18.3.4.23.3.2.1.2

Parameter: Interface MTU

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**
Default: 4608
Options: 1 through 9188 octets
Function: Specifies the largest packet size that the router can transmit on this interface.
Instructions: Enter a value that is appropriate for the network.
MIB Object ID: 1.3.6.1.4.1.18.3.4.23.3.2.1.9

Parameter: Data Path Enable

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**

Default: Enable

Options: Enable | Disable

Function: If you disconnect the cable from the ATM module, this parameter specifies whether or not the router disables the interface between the driver and the higher-level software (the data path interface).

If you select Enable, when you disconnect the cable from the ATM, the router disables the data path interface after the time you specify with the Data Path Notify Timeout parameter.

If you select Disable, the router does not disable the data path interface when you disconnect the cable from the ATM module.

Instructions: Select Enable or Disable. If you select Enable, be sure to enter an appropriate value for the Data Path Notify Timeout parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.3.2.1.11

Parameter: Data Path Notify Timeout

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**

Default: 1 second

Options: 0 through 3600 seconds

Function: Defines the time the router waits before disabling the data path interface when you disconnect the cable from the ATM module, providing that you set the Data Path Enable parameter to Enable.

Instructions: Accept the default or enter an appropriate time value.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.3.2.1.12

Parameter: **SVC Inactivity Timeout Enable**

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**

Default: Enable

Options: Enable | Disable

Function: If you select Enable, the router disables any switched virtual circuit (SVC) on which the router receives or transmits no cells for the number of seconds you specify using the SVC Inactivity Timeout (Secs) parameter.

If you select Disable, the router keeps SVCs open unless you close them by another method.

Instructions: Select Enable or Disable.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.3.2.1.13

Parameter: **SVC Inactivity Timeout (Secs)**

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**

Default: 1200 seconds

Options: 60 through 3600 seconds

Function: If the router receives or transmits no cells on an SVC for this number of seconds, it closes the SVC, providing that you set the SVC Inactivity Timeout Enable parameter to Enable.

Instructions: Enter an appropriate time, and be sure to set the SVC Inactivity Timeout Enable parameter to Enable.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.3.2.1.14

Parameter: **Framing Mode**

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**

Default: SONET

Options: SDH | SONET | CBIT | M23 | G751 | G832

Function: Specifies the transceiver mode for the physical interface.

Instructions: Select a transceiver mode as follows:

- SDH or SONET for OC-3 modules
- CBIT or M23 for DS3 modules
- G751 or G832 for E3 modules

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.3.2.1.17

Parameter: Clocking Signal Source

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**

Default: Internal

Options: Internal | External

Function: Specifies whether the router uses its internal clock or an external clock for time signals on this interface.

Instructions: Select Internal to use the router's clock; select External to use an external clock.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.3.2.1.18

Parameter: DS3 Line Build Out

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**

Default: Short

Options: Short | Long

Function: Conditions router signals to mitigate attenuation, which depends on the physical length of the line.

You can set this parameter only when using DS3 modules.

Instructions: Select Short for lines shorter than 225 ft; select Long for lines 225 ft or longer.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.3.2.1.23

Parameter: DS3 Scrambling

Path: Configuration Manager > Circuits > Edit Circuits > **Edit** > **Line Attributes**

Default: On

Options: On | Off

Function: If you select On, the router randomizes cell payload sufficiently to guarantee cell synchronization. If you select Off, cell synchronization problems may result.

Note that ATM devices with different scrambling settings cannot communicate. For example, if you configure a router to enable scrambling, and configure a hub to disable scrambling, the router and hub cannot communicate.

You can only set this parameter when using DS3 modules.

Instructions: Select On or Off. If you select On, be sure to enable scrambling for all devices on the network. If you select Off, be sure to disable scrambling for all devices on the network.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.3.2.1.22

ATM Interface Parameter Descriptions

Interface parameters define the state of the ATM interface. Figure A-2 shows the window sequence for the interface attributes category.

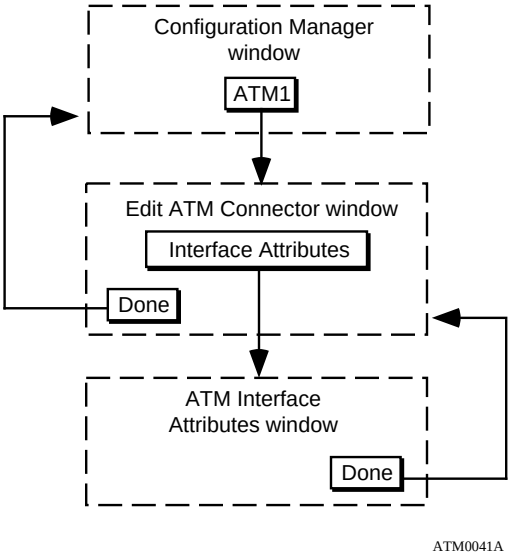

Figure A-2. Interface Attributes Window Sequence

Parameter: Administrative State

Path: Configuration Manager > Protocols > ATM > Interfaces

Default: Up

Options: Up | Down

Function: Specifies whether this interface is enabled or disabled.

Instructions: Accept the default, Up, if you want traffic to flow over this interface. Set the state to Down if you do not want traffic to flow over this interface.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.1.1.3

Parameter:	**Enable ATM Signaling**
Path:	Configuration Manager > Protocols > ATM > Interfaces
Default:	Enable
Options:	Enable | Disable
Function:	Specifies whether ATM signaling is enabled or disabled for this interface. Signaling allows you to configure switched features (for example, SVCs and LANE) on the interface. If you do not intend to configure any switched features on this interface (that is, you want this interface to run only PVCs), disabling this parameter makes additional system resources available.
Instructions:	Accept the default, Enable, if you want to enable signaling on this interface. Set the state to Disable if you want to disable signaling on this interface.
MIB Object ID:	1.3.6.1.4.1.18.3.4.23.1.1.1.16

Parameter:	**Use Hardware MAC Address**
Path:	Configuration Manager > Protocols > ATM > Interfaces
Default:	Enable
Options:	Enable | Disable
Function:	Specifies whether or not to use the hardware MAC address for this interface. When enabled, the Configuration Manager uses the ATM hardware MAC address of the link module for the endstation identifier when automatically generating the user part (suffix) of an SVC service record ATM address. When disabled, the Configuration Manager uses the value specified in the MAC Address Override parameter to define the endstation identifier when automatically generating the user part (suffix) of an SVC service record ATM address.
Instructions:	Accept the default, Enable, if you want to use the MAC address of the ATM interface when automatically generating the endstation identifier portion of the ATM address user part. Set this parameter to Disable if you want to use the MAC Address Override value when automatically generating the endstation identifier portion of the ATM address user part. If you set this parameter to Disable, you must enter a value for the MAC Address Override parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.4.23.1.1.1.18

Parameter: MAC Address Override

Path: Configuration Manager > Protocols > ATM > Interfaces

Default: None

Options: Any valid MAC address

Function: Redefines the hardware MAC address for this interface. Also defines the endstation identifier for this interface when automatically generating the user part (suffix) of an SVC service record ATM address.

Using the MAC Address Override parameter is very helpful when you want to "hot-swap" ATM link modules.

For example, when "hot-swapping" ATM link modules, you can enter the MAC address of the original ATM link module as the MAC Address Override value for the new ATM link module. This allows you to keep the information you have already configured on the existing ATM link module while maintaining the integrity of the existing client information on the network.

Instructions: Enter a valid MAC address.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.1.1.19

ATM Service Record Parameter Descriptions

Service record parameters define the ATM service records for an interface. The ATM Service Records List window also provides access to

- Specific PVC parameters (PVC service records only)
- A list of all SVCs on that service record (SVC service records only)
- Access to LEC attributes (SVC service records using LANE data encapsulation)

Figure A-3 shows the sequence of windows that can appear when you select the service attributes category and configure a PVC.

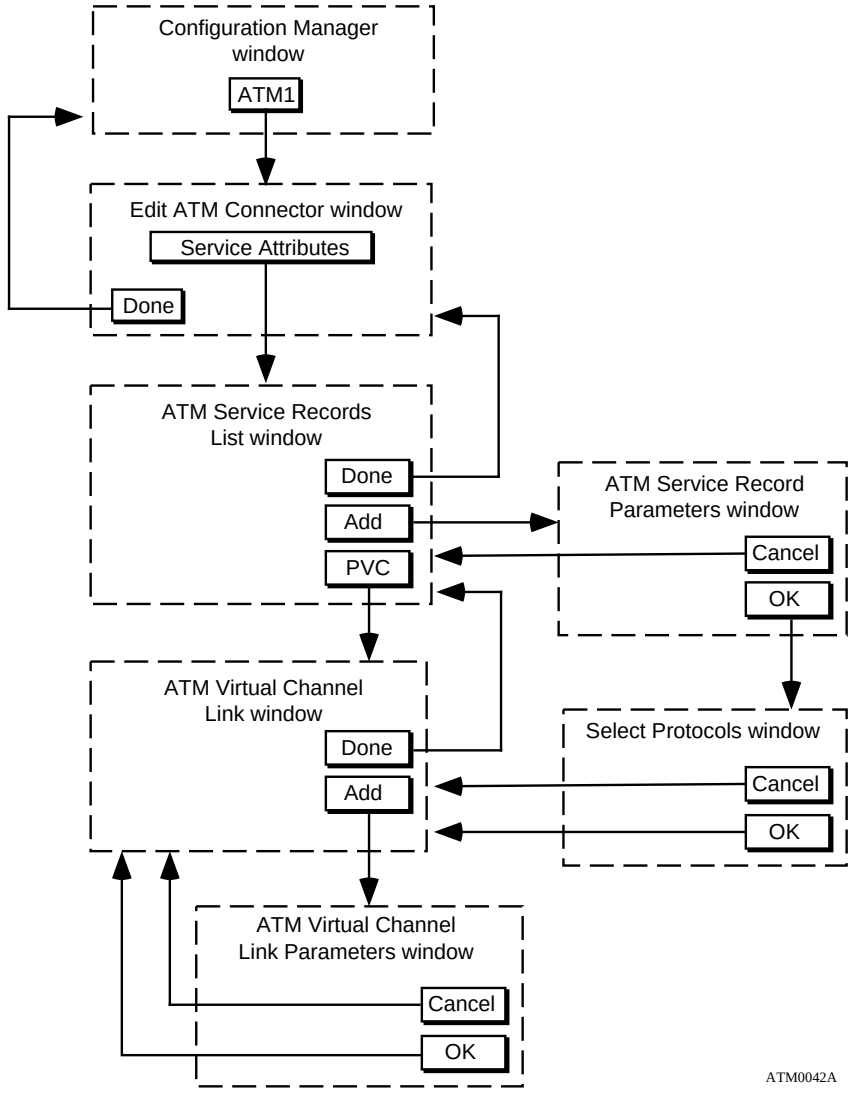

Figure A-3. Service Attributes Window Sequence (PVCs)

Figure A-4 shows the sequence of windows that can appear when you select the service attributes category and configure an SVC with LANE.

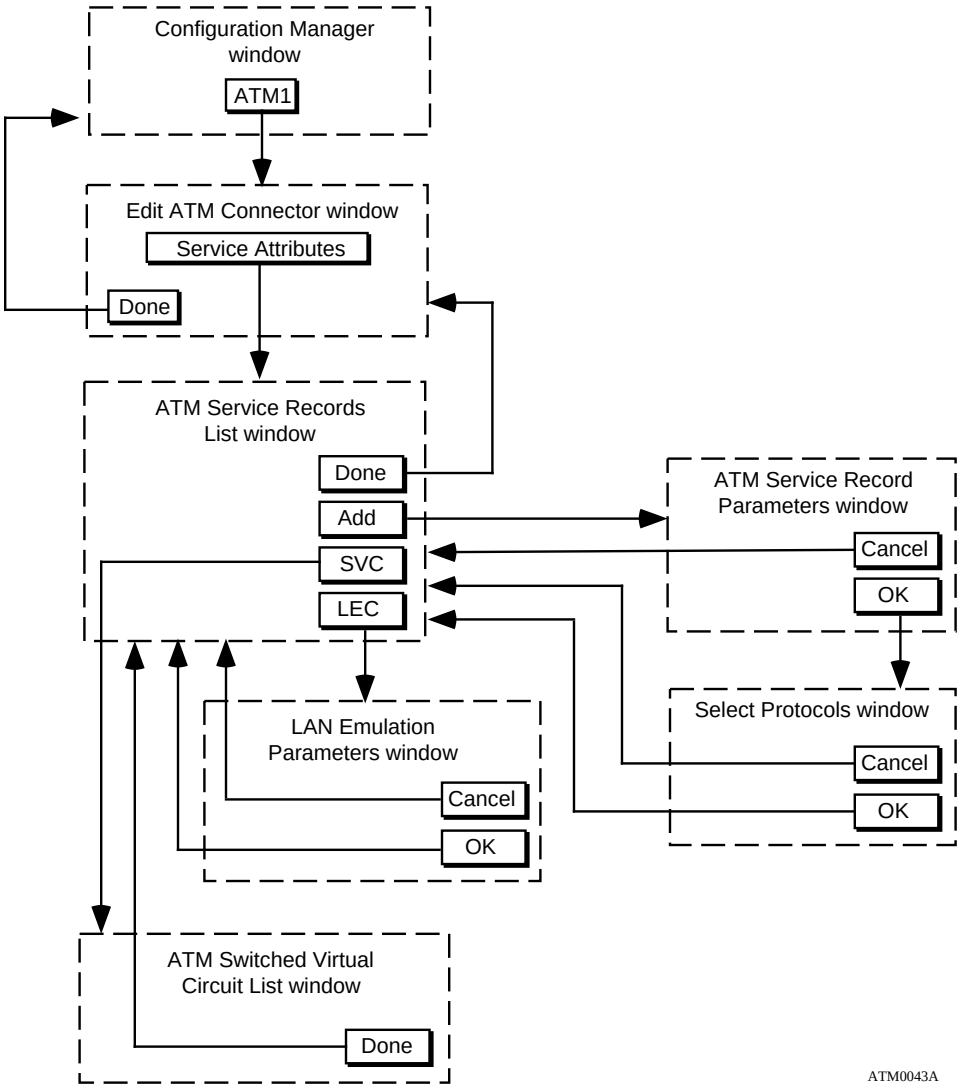

Figure A-4. Service Attributes Window Sequence (SVCs with LANE)

Note: With the exception of the LAN Emulation Parameters window, the service attributes window sequence for an SVC running LLC/SNAP or NULL data encapsulation (RFC 1577) is the same as in Figure A-4.

Parameter: Enable/Disable

Path: Configuration Manager > Protocols > ATM > Service Records

Default: Enable

Options: Enable | Disable

Function: Enables or disables this service record.

Instructions: Accept the default, Enable, if you want traffic to flow on this service record and its VCs. Set to Disable if you do not want traffic to flow on this service record or any of its VCs.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.2.1.2

Parameter: Data Encapsulation Type

Path: Configuration Manager > Protocols > ATM > Service Records > **Add**

Default: LANE (signaling enabled) or LLC/SNAP (signaling disabled)

Options: LANE | LLC/SNAP | NLPID | NULL

Function: Identifies the data encapsulation type for this service record.

You can use this parameter to select

- LLC/SNAP, NLPID, or NULL data encapsulation for service records containing PVCs
- LLC/SNAP data encapsulation for service records containing hybrid PVCs
- LANE for service records containing SVCs over which you want to run LAN emulation
- LLC/SNAP or NULL for service records containing SVCs over which you want to run classical IP (RFC 1577)

If you select NULL, the router interprets this as virtual, channel-based multiplexing, which is not supported for bridging.

Instructions: Select a data encapsulation type.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.2.1.5

Parameter: **Virtual Connection Type**

Path: Configuration Manager > Protocols > ATM > Service Records > **Add**

Default: SVC (signaling enabled) or PVC (signaling disabled)

Options: PVC | SVC

Function: Identifies the virtual connection type of this service record.

Instructions: Accept the default, SVC, if you want the service record to contain switched virtual circuits. Select PVC if you want the service record to contain permanent virtual circuits.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.2.1.7

Parameter: **User Part Autogeneration**

Path: Configuration Manager > Protocols > ATM > Service Records > **Add**

and

Configuration Manager > Protocols > ATM > Service Records

Default: Enable

Options: Enable | Disable

Function: Enables or disables autogeneration of the ATM Address User Part (see the next parameter). Depending on the settings in the ATM Interface Attributes window, the ATM Address User Part contains either the hardware MAC address or a MAC address override value.

Instructions: Accept the default, Enable, if you want the Configuration Manager to automatically generate the ATM Address User Part for any SVC service record that you add to this interface.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.2.1.11

Parameter: **ATM Addr User Part**

Path: Configuration Manager > Protocols > ATM > Service Records > **Add**

and

Configuration Manager > Protocols > ATM > Service Records

Default: None

Options: 00000000000000 through FEFFFFFFFFFFF

Function: The Configuration Manager allows you to autogenerate this parameter (see the User Part Autogeneration parameter). Depending on the settings in the ATM Interface Attributes window, this parameter can autogenerate this address using

- The 6-byte hardware MAC address of the ATM interface
- A MAC Address Override value that you specify

In both cases, autogeneration creates a unique selector byte for each service record on the interface.

Instructions: Enter a value in the range specified.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.2.1.9

Parameter: **ATM Addr Net Prefix (Optional)**

Path: Configuration Manager > Protocols > ATM > Service Records > **Add**

and

Configuration Manager > Protocols > ATM > Service Records

Default: None

Options: XX00000000000000000000000 through XXFFFFFFFFFFFFFFFFFFFFFF

where XX = 39, 45, or 47

Function: Defines the Network Prefix of the ATM address for this service record. The network prefix specifies the ATM domain of which this service record is a part.

The XX byte must contain 39, 45, or 47. These values define the authority and format identifier (AFI). The AFI byte identifies the group responsible for allocating the prefix and the format the prefix uses. For more information about the AFI byte, refer to the ATM Forum UNI specification (Version 3.0).

Instructions: Setting this parameter is optional. If you do not enter an ATM Address Network Prefix in the range specified above, the service record accepts the first prefix value that it receives from the switch.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.2.1.8

Parameter:	**Emulated LAN Name**
Path:	Configuration Manager > Protocols > ATM > Service Records > **Add** and Configuration Manager > Protocols > ATM > Service Records
Default:	Default ELAN
Options:	Leave blank or enter up to 128 alphanumeric characters
Function:	Identifies the name of the emulated LAN that this LE client joins when it joins an emulated LAN. Clients that use Automatic configuration mode use this parameter in their LE_CONFIGURE_REQUEST frames. Clients that use Manual configuration mode use this parameter in their LE_JOIN_REQUEST frames. Entering an ELAN name is optional. However, if you do not enter an ELAN name, the LAN emulation client server (LECS) assigns the LE client to an ELAN for this domain.
Instructions:	Either leave this parameter blank or enter an ELAN name (up to 128 alphanumeric characters) that identifies the emulated LAN you want this client to join.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.5.20.1.1.8

Parameter: Emulated LAN Type

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**

Default: Unspecified

Options: Unspecified | IEEE8023

Function: Indicates the data frame format this client uses when it joins an emulated LAN. Clients that use Automatic configuration mode use this parameter in their LE_CONFIGURE_REQUEST frames to specify the LAN type. Clients that use Manual configuration mode use this parameter in their LE_JOIN_REQUEST frames to specify the LAN type.

Selecting manual configuration mode (refer to the parameter description above) requires that you set the Emulated LAN Type to IEEE8023.

Instructions: Accept the default, Unspecified, if you want the client to obtain the LAN type from the LAN emulation configuration server (LECS) when it joins an emulated LAN. Select IEEE8023 if you want the client to join only Ethernet emulated LANs.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.6

Parameter: MTU

Path: Configuration Manager > Protocols > ATM > Service Records

Default: 4608

Options: 0 through 9188

Function: Defines the Maximum Transmission Unit (MTU), in bytes, that this service record can send. The MTU size is typically determined by the driver. However, this parameter allows you to override the driver default to accommodate connection to devices that require different MTU sizes.

Instructions: Accept the default or enter an MTU size for this service record.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.2.1.12

Note: For full compatibility with RFC 1577, you may have to specify an MTU size of 9188 bytes.

ATM Virtual Channel Link Parameter Descriptions

Note: ATM does not allow duplicate VPI/VCI pairs on the same physical interface. However, duplicate VPI/VCI pairs can exist on different physical interfaces.

Parameter: VPI Number

Path: Configuration Manager > Protocols > ATM > Service Records > **PVC** > **Add**

Default: None

Options: 0 through 255

Function: Identifies the virtual path of the PVC. The VPI is part of the cell header. The header can contain a maximum of 8 VPI bits for a UNI connection. This bit range allows for path identifiers from 0 to 255.

Instructions: Enter a value from 0 through 255.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.5.1.3

Note: Following the recommendation of the ATM Forum, virtual channel identifiers from 0 through 31 are reserved for signaling and added functionality.

Parameter: VCI Number

Path: Configuration Manager > Protocols > ATM > Service Records > **PVC** > **Add**

Default: None

Options: 32 through 65535

Function: Identifies the virtual channel of the PVC. The VCI is part of the cell header. The header can contain a maximum of 16 VCI bits. This bit range allows for path identifiers from 0 through 65535.

Instructions: Enter a value from 32 through 65535.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.5.1.4

Note: Following the recommendation of the ATM Forum, virtual channel identifiers from 0 through 31 are reserved for signaling and added functionality.

Parameter: Hybrid/Bridged VC

Path: Configuration Manager > Protocols > ATM > Service Records > **PVC**

Default: No

Options: Yes | No

Function: Specifies whether the VC is set to hybrid access mode.

Instructions: Accept the default, No, if you want the VC to work in group access mode only. Set to Yes if you want the VC to operate as a hybrid VC.

For more information about the group and hybrid access modes, refer to “PVC Access Methods” in Chapter 2.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.5.1.25

Parameter: Administrative State

Path: Configuration Manager > Protocols > ATM > Service Records > **PVC**

Default: Up

Options: Up | Down

Function: Specifies the administrative state of the PVC. The Up state indicates that traffic flow is enabled on this PVC. The Down state indicates that traffic flow is disabled on this PVC.

Instructions: Accept the default, Up, if you want traffic to flow on this PVC. Set the state to Down if you do not want traffic to flow on this PVC.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.5.1.5

Parameter: Xmit Peak Cell Rate (cells/s)

Path: Configuration Manager > Protocols > ATM > Service Records > **PVC**

Default: 2358

Options: 300 through 365566 (ATM FRE2 OC-3 SONET/SDH ILI pairs)
128 through 353207 (ATM ARE OC-3 SONET/SDH ILI pairs and Model 5780 ATM routers)
128 through 96000 (ATM ARE DS-3 ILI pairs)
128 through 80000 (ATM ARE E-3 ILI pairs; G832 Framing Mode)
128 through 72000 (ATM ARE E-3 ILI pairs; G751 Framing Mode)

Function: Specifies the upper traffic limit, in cells/s, that the ATM connection can submit. How you set the peak cell rate depends on

- The optical transmission rate of your ATM device
- The amount of traffic you expect on a particular VC
- The rate you desire for each VC

Instructions: After you determine the transmission rate of your ATM device, set the peak cell rate within the range specified above.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.5.1.8

Parameter: Xmit Sustainable Cell Rate (cells/s)

Path: Configuration Manager > Protocols > ATM > Service Records > **PVC**

Default: 2358

Options: 300 through 365566 (ATM FRE2 OC-3 SONET/SDH ILI pairs)
0, 128 through 353207 (ATM ARE OC-3 SONET/SDH ILI pairs and Model 5780 ATM routers)
0, 128 through 96000 (ATM ARE DS-3 ILI pairs)
0, 128 through 80000 (ATM ARE E-3 ILI pairs; G832 Framing Mode)
0, 128 through 72000 (ATM ARE E-3 ILI pairs; G751 Framing Mode)

Function: Specifies the upper limit of the ATM connection conforming average rate. The average rate equals the total number of cells transmitted, divided by the duration of the connection.

Using the sustainable cell rate (SCR), you can define the future cell flow of a VC in greater detail than by just using the peak cell rate.

For ATM FRE2 ILI pairs, specifying the SCR controls the rate over time -- not at a specific instant of time -- and can help you more efficiently use your network resources.

For ATM ARE ILI pairs and Model 5780 ATM routers, the SCR maps directly to the minimum cell rate (MCR). The MCR defines the minimum amount of guaranteed bandwidth allowed for PVCs and Control VCs on the ATM line.

When setting the SCR for ATM FRE2 ILI pairs, keep the following in mind:

- The SCR is essentially a future average. By setting the SCR you are specifying the cell rate, over time, to which you want the VC to conform.
- To be useful, the SCR must not exceed the PCR.
- If you know the user average rate, set the SCR about 10 percent higher than this value.
- ATM FRE2 ILI pairs require a minimum SCR value of 300 cells/s. PVCs may fail to operate with SCR values less than 300 cells/s.

(continued)

Parameter: Xmit Sustainable Cell Rate (cells/s) *(continued)*

When setting the SCR for ATM ARE ILI pairs and Model 5780 ATM routers, keep the following in mind:

- The SCR maps directly to the MCR.
- The MCR provides guaranteed bandwidth for PVCs and Control VCs while allowing sufficient bandwidth for SVCs to operate.
- To be useful, the SCR must not exceed the PCR.
- If you know the user average rate, set the SCR about 10 percent higher than this value.
- ATM ARE ILI pairs and Model 5780 ATM routers require a minimum SCR value of 128 cells/s. VCs may fail to operate with SCR values less than 128 cells/s.
- ATM ARE ILI pairs and Model 5780 ATM routers allow you to enter an SCR value of 0. Entering 0 for the SCR turns off this function.
- The E-3 framing mode setting affects the maximum SCR.

Instructions: After you determine the transmission rate of your ATM device, set the sustainable cell rate within the range specified under “Options.” For ATM ARE ILI pairs and Model 5780 ATM routers, you can enter 0 to turn off this function.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.5.1.9

Parameter: **Xmit Burst Size (cells)**

Path: Configuration Manager > Protocols > ATM > Service Records > **PVC**

Default: 40

Options: 1 through 65535

Function: For ATM FRE2 ILI pairs, the maximum burst size (MBS) is the maximum length of a cell stream on a particular VC. The MBS specifies the maximum number of sequential cells allowed on a VC, at the peak cell rate, before the VC must relinquish bandwidth to other VCs.

When you set the MBS, we suggest that you select a value larger than the largest packet your PVC or control VC can transmit (that is, the Maximum AAL CPCS Transmit SDU size). For example, if your VC accepts packets that are less than 2358 bytes long (PVC default), set your MBS value between 45 and 50 cells.

Instructions: Set a value in the specified range.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.5.1.10

Note: ATM ARE ILI pairs and Model 5780 ATM routers ignore the maximum burst size.

Parameter: **Maximum AAL CPCS Transmit SDU Size**

Path: Configuration Manager > Protocols > ATM > Service Records > **PVC**

Default: 4608

Options: 1 through 65535

Function: Specifies the maximum AAL CPCS SDU size, in bytes, that this VC supports in the transmit direction.

Instructions: Enter an octet value that represents the maximum packet size you intend this VC to transmit. We suggest that you accept the default value of 4608 bytes. Most packets fall well within this limit.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.5.1.17

Parameter: **Maximum AAL CPCS Receive SDU Size**

Path: Configuration Manager > Protocols > ATM > Service Records > **PVC**

Default: 4608

Options: 1 through 65535

Function: Specifies the maximum AAL CPCS SDU size, in bytes, that this VC supports in the receive direction.

Instructions: Enter an octet value that represents the maximum packet size you intend this VC to receive. We suggest that you accept the default value of 4608 bytes. Most packets fall well within this limit.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.5.1.18

Parameter: **Data Encapsulation Type**

Path: Configuration Manager > Protocols > ATM > Service Records > **PVC**

Default: LLC/SNAP

Options: LLC/SNAP | NLPID | NULL

Function: Specifies the type of data encapsulation used over AAL 5 SSCS layers.

Use this parameter to select LLC/SNAP, NLPID, or NULL data encapsulation for

- All PVCs on a particular service record
- Hybrid PVCs

Instructions: We recommend selecting LLC/SNAP. If you select NULL, the router interprets this as virtual, channel-based multiplexing, which is not supported for bridging.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.5.1.19

LAN Emulation Parameter Descriptions

Parameter: Enable

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**
Default: Enable
Options: Enable | Disable
Function: Enables or disables LAN emulation on this service record.
Instructions: Accept the default, Enable, if you want LAN emulation to remain enabled on this service record. Select Disable if you do not want LAN emulation enabled on this service record.
MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.2

Parameter: Owner

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**
Default: None
Options: Leave blank or enter up to 128 alphanumeric characters
Function: Identifies this LAN emulation client. This parameter is optional.
Instructions: Either leave this parameter blank or enter a text string (up to 128 alphanumeric characters) to identify this LAN emulation client.
MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.4

Parameter: Configuration Mode

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**
Default: Automatic
Options: Automatic | Manual
Function: Indicates whether this LAN emulation client configures automatically (that is, uses information from the LECS) or manually (that is, uses information from the LAN Emulation Parameters window).
Instructions: Accept the default, Automatic, if you want this client to configure automatically. Select Manual if you do not want the router to autoconfigure.
MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.5

Parameter: **Emulated LAN Type**

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**

Default: Unspecified

Options: Unspecified | IEEE8023

Function: Indicates the data frame format this client uses when it joins an emulated LAN. Clients that use Automatic configuration mode use this parameter in their LE_CONFIGURE_REQUEST frames to specify the LAN type. Clients that use Manual configuration mode use this parameter in their LE_JOIN_REQUEST frames to specify the LAN type.

Selecting manual configuration mode (refer to the parameter description above) requires that you set the Emulated LAN Type to IEEE8023.

Instructions: Accept the default, Unspecified, if you want the client to obtain the LAN type from the LAN emulation configuration server (LECS) when it joins an emulated LAN. Select IEEE8023 if you want the client to join only Ethernet emulated LANs.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.6

Parameter: **Maximum Data Frame Size**

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**

Default: Unspecified

Options: Unspecified | 1516

Function: Defines the maximum data frame size (in octets) that this client uses when it joins an emulated LAN. Clients that use Automatic configuration mode use this parameter in their LE_CONFIGURE_REQUEST frames. Clients that use Manual configuration mode use this parameter in their LE_JOIN_REQUEST frames.

Selecting Manual configuration mode automatically sets the Maximum Data Frame Size to 1516.

Instructions: Accept the default, Unspecified, if you want the client to obtain the maximum data frame size when it joins an emulated LAN. Select 1516 if you want to designate the maximum data frame size that this client can

- Send on the Multicast Send VCC
- Receive on the Multicast Forward VCC
- Send and receive on Data Direct VCCs

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.7

Parameter: Emulated LAN Name

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**

Default: Default ELAN

Options: Leave blank or enter up to 128 alphanumeric characters.

Function: Identifies the name of the emulated LAN that this LE client joins when it joins an emulated LAN. Clients that use Automatic configuration mode use this parameter in their LE_CONFIGURE_REQUEST frames. Clients that use Manual configuration mode use this parameter in their LE_JOIN_REQUEST frames.

Entering an ELAN name is optional. However, if you do not enter an ELAN name, the LAN emulation client server (LECS) assigns the LE client to an ELAN for this domain.

Instructions: Either leave this parameter blank or enter an ELAN name (up to 128 alphanumeric characters) that identifies the emulated LAN you want this client to join.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.8

Parameter: LE Server ATM Address

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**

Default: None

Options: Any valid ATM address

Function: Defines the LAN emulation server that this client uses when it starts. The client uses the LAN emulation server to establish the Control Direct VCC. You do not have to set this address when using Automatic configuration mode.

Instructions: If you select Manual configuration mode, enter the address of the LAN emulation server. If you select Automatic configuration mode, you do not have to enter this address.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.9

Parameter: **Control Timeout**

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**

Default: 5

Options: 5 through 32767

Function: Defines the timeout period used for timing out most request/response control frame interactions.

Instructions: Accept the default, 5, or enter a value from 5 through 32767.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.10

Parameter: **Max Unknown Frame Count**

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**

Default: 1

Options: 1 through 10

Function: Defines the maximum number of unknown frames an LE client can send within the interval specified with the Max Unknown Frame Time parameter. A frame is considered unknown when the LE client does not recognize the destination MAC address. In this case, the unknown frame goes to the BUS for distribution.

This parameter helps to limit unknown frame traffic to the BUS.

Instructions: Accept the default, 1, or enter a value from 1 through 10.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.11

Parameter: Max Unknown Frame Time

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**

Default: 1

Options: 1 through 60

Function: Defines the Maximum Unknown Frame Time value (in seconds). This value specifies the maximum amount of time allowed to send the number of unknown frames specified with the Max Unknown Frame Count parameter.

For example, if you use the defaults for these parameters, a LAN emulation client can send up to one unknown frame within 1 second for any given MAC address, without having to initiate the address resolution protocol (ARP) to resolve that MAC address.

This parameter helps to limit unknown frame traffic to the BUS.

Instructions: Accept the default, 1, or enter a value from 1 through 60.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.12

Parameter: VCC Timeout Period Enable

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**

Default: Enable

Options: Enable | Disable

Function: Defines the state of the virtual channel connection (VCC) timeout period. When you enable this parameter, a LAN emulation client may release any unused data direct or multicast send VCCs after the VCC timeout period expires. The ATM drivers provide a timeout period of 20 minutes.

Instructions: Accept the default, Enable, if you want this LAN emulation client to release unused data direct VCCs after the VCC timeout period expires. Select Disable if you do not want this LAN emulation client to release unused data direct VCCs after the VCC timeout period expires.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.13

Parameter: **Max Retry Count**

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**

Default: 1

Options: 1 to 2

Function: Defines the maximum number of times a LAN emulation client can retry an LE_ARP_REQUEST (following the original request) for a given frame MAC address.

Instructions: Accept the default, 1, or enter 2 as the new value.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.14

Parameter: **Aging Time**

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**

Default: 300

Options: 10 through 300

Function: Defines the maximum amount of time (in seconds) that a LAN emulation client can maintain an entry in its LAN emulation ARP cache without verifying the relationship of that entry.

Instructions: Accept the default, 300, or enter a value from 10 through 300.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.15

Parameter: **Forward Delay Time**

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**

Default: 15

Options: 4 through 30

Function: While there are no changes occurring in network topology, this parameter defines the maximum amount of time (in seconds) that a LAN emulation client can maintain an entry in its LAN emulation ARP cache without verifying the relationship of that entry.

Instructions: Accept the default, 15, or enter a value from 4 through 30.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.16

Parameter: Expected LE_ARP Response Time

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**

Default: 3

Options: 1 through 30

Function: Defines the amount of time (in seconds) that the LAN emulation client expects an ARP request and ARP response cycle to take. The LAN emulation client uses this value during retries and verifications.

Instructions: Accept the default, 3, or enter a value from 1 through 30.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.1

Parameter: Flush Timeout

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**

Default: 4

Options: 1 through 4

Function: Defines the amount of time (in seconds) that the LAN emulation client waits to receive a flush response (after sending a flush request) before it takes recovery action by switching back to the BUS.

Instructions: Accept the default, 4, or enter a value from 1 through 4.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.18

Parameter: Path Switching Delay

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**

Default: 6

Options: 1 through 8

Function: Defines the amount of time (in seconds) that the LAN emulation client waits after sending a frame over an old VCC before it switches to a new VCC (this applies to multicast and data direct VCCs). You can use this parameter to bypass the Flush protocol (that is, when you disable the Flush Protocol parameter, the data for a specific MAC address automatically begins flowing over a new VC when the Path Switching Delay time elapses).

Instructions: Accept the default, 6, or enter a value from 1 through 8.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.19

Parameter: **Flush Protocol**

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**

Default: Enable

Options: Enable │ Disable

Function: Enables or disables the Flush protocol on this LE client.

The Flush protocol ensures that data destined for a particular MAC address arrives in sequence. Following a flush request, the Flush protocol drops cells with this MAC address while waiting for

- The flush response for that MAC address
- The flush timeout to expire for that MAC address

If the client receives a flush response for the cell MAC address, the cells for this MAC address begin flowing over a new virtual circuit. However, if the flush timeout expires for this MAC address, the cells begin flowing to the BUS.

When disabled, cells containing the same MAC address are dropped while waiting for the Path Switching Delay parameter to time out. After the Path Switching Delay time elapses, the data automatically begins flowing over a new virtual circuit.

Instructions: Accept the default, Enable, if you want the Flush protocol to operate on this LAN emulation client. Select Disable if you do not want the Flush protocol to operate on this LAN emulation client.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.25

Parameter: **LE Config Server ATM Address**

Path: Configuration Manager > Protocols > ATM > Service Records > **LEC**

Default: None

Options: Any valid LAN emulation configuration server (LECS) ATM address

Function: Defines the LECS ATM address. Entering an address for this parameter is optional. If you do not enter an address, the LE client uses the well-known LECS ATM address to open a configuration VCC to the configuration service.

Instructions: Leave blank or enter the ATM address of the LECS.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.5.20.1.1.30

ATM Signaling Parameter Descriptions

ATM Signaling attributes define the connection and timer limits the router uses to set up, maintain, and clear a switched connection.

The ATM Signaling Parameters window also provides access to the signaling VC parameters. The signaling VC provides a dedicated VPI (0) and VCI (5) for ATM signaling functions.

For control VC parameter descriptions, refer to “Signaling and ILMI Control VC Parameter Descriptions” later in this chapter.

Figure A-5 shows the window sequence for the ATM signaling category.

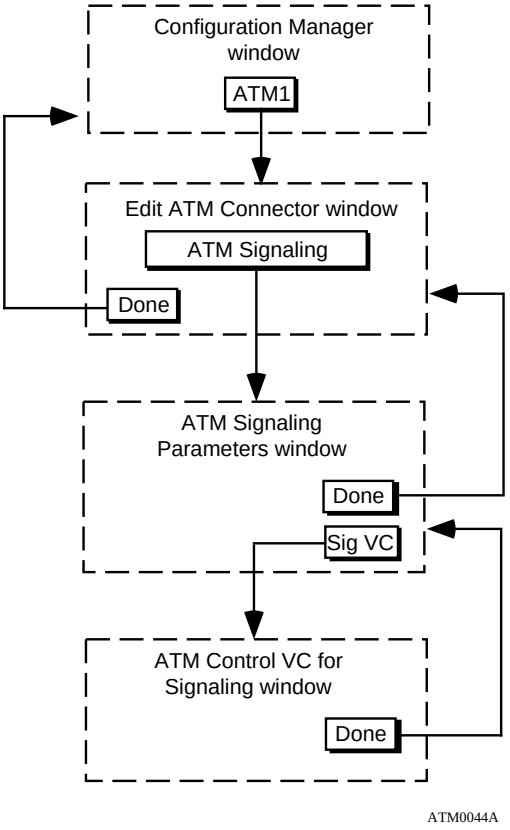

Figure A-5. ATM Signaling Parameters Window Sequence

Parameter: Enable

Path: Configuration Manager > Protocols > ATM > ATM Signaling

(This parameter also appears in the Initial ATM Signaling Config window.)

Default: Enable

Options: Enable | Disable

Function: Enables or disables ATM signaling on this interface.

Instructions: Accept the default, Enable, if you want signaling to remain enabled on this interface. Set to Disable if you do not want signaling enabled on this interface.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.2

Note: When you disable signaling on the interface, the ATM Service Record Parameters window automatically sets the Data Encapsulation Type parameter to LLC/SNAP and the Virtual Connection Type parameter to PVC.

Parameter: Protocol Standard

Path: Configuration Manager > Protocols > ATM > ATM Signaling

(This parameter also appears in the Initial ATM Signaling Config window.)

Default: UNI_V30

Options: UNI_V30 | UNI_V31

Function: Specifies how the interface defines Service Specific Connection Oriented Protocol (SSCOP) frames. Version 3.0 and Version 3.1 SSCOP frames are incompatible.

Instructions: You must assign the same protocol standard for both the router interface and the switch. Accept the default, UNI_V30, if the switch uses UNI Version 3.0 to define SSCOP frames. Select UNI_V31 if the switch uses UNI Version 3.1 to define SSCOP frames.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.15

Parameter: **Max Number of SVC Applications**

Path: Configuration Manager > Protocols > ATM > ATM Signaling

(This parameter also appears in the Initial ATM Signaling Config window.)

Default: 20

Options: 1 through 32767

Function: Identifies the maximum number of service access points (SAPs) allowed for this circuit. The number of SAPs corresponds to the number of LAN emulation or IP (RFC 1577) clients allowed for the circuit.

Instructions: Accept the default, 20, or enter a value from 1 through 32767.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.6

Parameter: **Max Point to Point Connections**

Path: Configuration Manager > Protocols > ATM > ATM Signaling

(This parameter also appears in the initial ATM Signaling Config window.)

Default: 1000

Options: 0 through 32767

Function: Identifies the maximum number of simultaneous point-to-point connections allowed for this circuit.

Instructions: Accept the default, 1000, or enter a value from 0 through 32767.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.7

Parameter: **Max Point to Multipoint Connections**

Path: Configuration Manager > Protocols > ATM > ATM Signaling

(This parameter also appears in the Initial ATM Signaling Config window.)

Default: 40

Options: 0 through 32767

Function: Identifies the maximum number of simultaneous point-to-multipoint connections allowed for this circuit.

Instructions: Accept the default, 40, or enter a value from 0 through 32767.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.8

Parameter: **Max Parties in Multipoint Connections**

Path: Configuration Manager > Protocols > ATM > ATM Signaling

(This parameter also appears in the Initial ATM Signaling Config window.)

Default: 1

Options: 0 through 32767

Function: Identifies the maximum number of simultaneous parties in a point-to-multipoint connection allowed for this circuit.

Instructions: Accept the default, 1, or enter a value from 0 through 32767.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.9

Parameter: **Min Memory Threshold**

Path: Configuration Manager > Protocols > ATM > ATM Signaling

Default: 20%

Options: 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100%

Function: Defines the minimum percentage of buffer memory necessary to enable a new call.

Instructions: Accept the default, 20%, or select another percentage.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.11

Parameter: **VPI**

Path: Configuration Manager > Protocols > ATM > ATM Signaling

Default: 0

Options: 0 through 255

Function: Defines the virtual path identifier (VPI) for the signaling VC. The signaling VC is a dedicated VPI/VCI pair reserved for signaling messages.

Instructions: Accept the default value, 0, or enter a value from 0 through 255.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.13

Caution: The signaling VC (0/5) and the ILMI VC (0/16) are reserved. These VCs remain in an operational state as long as signaling is enabled on the ATM interface. Because most ATM devices use these VPI/VCI pairs for signaling, we recommend that you not change these values.

Parameter: VCI

Path: Configuration Manager > Protocols > ATM > ATM Signaling

Default: 5

Options: 1 through 65535

Function: Defines the virtual channel identifier (VCI) for the signaling VC. The signaling VC is a dedicated VPI/VCI pair reserved for signaling messages.

Instructions: Accept the default, 5, or enter a value from 1 through 65535.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.14

Caution: The signaling VC (0/5) and the ILMI VC (0/16) are reserved. These VCs remain in an operational state as long as signaling is enabled on the ATM interface. Because most ATM devices use these VPI/VCI pairs for signaling, we recommend that you not change these values.

Parameter: T303

Path: Configuration Manager > Protocols > ATM > ATM Signaling

Default: 4

Options: 1 through 24

Function: Defines the Setup Sent timer value (in seconds). This timer begins when the circuit initiates a call/connection request by sending a SETUP message over the signaling VC.

The Setup Sent timer stops when the circuit receives either a CONNECT message (indicating connection), CALL PROCEEDING message (indicating that the network received the SETUP message), or RELEASE COMPLETE message (indicating the rejection of the SETUP message) from the network.

If the circuit does not receive one of these messages within the allotted time, it transmits the SETUP message a second time. If the circuit still does not receive a response, it clears the connection.

Instructions: Accept the default, 4, or enter a value from 1 through 24.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.25

Parameter: T308

Path: Configuration Manager > Protocols > ATM > ATM Signaling

Default: 30

Options: 1 through 180

Function: Defines the Release Sent timer value (in seconds). This timer begins when the circuit sends a RELEASE message to initiate clearing of an SVC. Sending this RELEASE message places the network in the Release Request state.

The Release Sent timer stops when the circuit receives either a RELEASE message (that is, both the circuit and the network sent RELEASE messages at the same time) or a RELEASE COMPLETE message from the network.

If the timer expires before the circuit receives one of these messages, the circuit transmits the RELEASE message a second time. If the circuit still does not receive a response, the circuit releases the call reference and begins a restart procedure.

Instructions: Accept the default, 30, or enter a value from 1 through 180.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.26

Parameter: T309

Path: Configuration Manager > Protocols > ATM > ATM Signaling

Default: 10

Options: 1 through 540

Function: Defines the SAAL Data Link Connect timer value (in seconds). This timer begins when a Signaling AAL malfunction occurs.

The SAAL Data Link Connect timer stops when the circuit re-establishes SAAL (that is, when the circuit sends an AAL-ESTABLISH-REQUEST and receives an AAL-ESTABLISH-CONFIRM message).

If the timer expires before the circuit can re-establish SAAL, the circuit clears the connection.

Instructions: Accept the default, 10, or enter a value from 1 through 540.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.27

Parameter: T310

Path: Configuration Manager > Protocols > ATM > ATM Signaling

Default: 10

Options: 1 through 60

Function: Defines the Call Proceeding Received timer value (in seconds). This timer begins when the circuit receives a CALL PROCEEDING message from the network.

If the signaling does not receive a CONNECT or RELEASE message before this timer expires, it clears the connection for that virtual circuit.

Instructions: Accept the default, 10, or enter a value from 1 through 60.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.28

Parameter: T313

Path: Configuration Manager > Protocols > ATM > ATM Signaling

Default: 4

Options: 1 through 24

Function: Defines the Connect Sent timer value (in seconds). This timer begins when the circuit sends a CONNECT message to the network.

The Connect Sent timer stops when the circuit receives a CONNECT ACKNOWLEDGE message from the network (indicating the completion of the ATM connection for that interface).

If the timer expires before the circuit receives a CONNECT ACKNOWLEDGE message, the circuit clears the connection.

Instructions: Accept the default, 4, or enter a value from 1 through 24.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.29

Parameter: T316

Path: Configuration Manager > Protocols > ATM > ATM Signaling

Default: 120

Options: 1 through 720

Function: Defines the Restart Request Sent on Interface timer value (in seconds). This timer begins when the circuit sends a RESTART message to the network. The circuit uses the RESTART message to return all VCs on the interface to the idle condition.

The Restart Request Sent on Interface timer stops when the circuit receives a RESTART ACKNOWLEDGE message from the network.

If the timer expires before the circuit receives a RESTART ACKNOWLEDGE message, the circuit can transmit as many RESTART messages as specified with the Num Restarts ReXmitted parameter (refer to the parameter description later in this section). If the circuit still does not receive a response, the circuit enters the Null state until the appropriate maintenance action is taken.

Instructions: Accept the default, 120, or enter a value from 1 through 720.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.30

Parameter: T316c

Path: Configuration Manager > Protocols > ATM > ATM Signaling

Default: 120

Options: 1 through 720

Function: Defines the Restart Request Sent on Channel timer value (in seconds). This timer begins when the circuit sends a RESTART message to the network. The circuit uses the RESTART message to return this individual VC on the interface to the idle condition.

The Restart Request Sent on Channel timer stops when the circuit receives a RESTART ACKNOWLEDGE message from the network.

If the timer expires before the circuit receives a RESTART ACKNOWLEDGE message, the circuit can transmit as many RESTART messages as specified with the Num Restarts ReXmitted parameter (refer to the parameter description later in this section). If the circuit still does not receive a response, the circuit enters the Null state until the appropriate maintenance action is taken.

Instructions: Accept the default, 120, or enter a value from 1 through 720.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.31

Parameter: **T322**

Path: Configuration Manager > Protocols > ATM > ATM Signaling

Default: 4

Options: 1 through 24

Function: Defines the Status Enquiry Sent timer value (in seconds). This timer begins when the circuit sends a STATUS ENQUIRY message to the network. This message checks the validity of a call by requesting the call state (that is, the state of an active call, the state of a call in progress, or the Null state if the call reference does not relate to an active call or a call in progress).

The Status Enquiry Sent timer stops when the circuit receives a STATUS message from the network.

If the timer expires before the circuit receives a STATUS message, the circuit can transmit as many STATUS ENQUIRY messages as specified with the Num Stat Enquiries ReXmitted parameter. If the circuit still does not receive a response, the circuit clears the call.

Instructions: Accept the default, 4, or enter a value from 1 through 24.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.32

Parameter: **TDisc**

Path: Configuration Manager > Protocols > ATM > ATM Signaling

Default: 4

Options: 1 through 180

Function: Defines the SAAL Data Link Disconnect timer value (in seconds). This internal timer alerts upper layers that the link is down. The timer begins if the entire link goes down for any reason.

When the link goes down, the SAAL layer sends a DISCONNECT REQUEST message to the upper-layer application manager. The SAAL layer sends a disconnect request every time the SAAL Data Link Disconnect timer expires, and continues to send this message until the link becomes operational.

Instructions: Accept the default, 4, or enter a value from 1 through 180.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.33

Parameter: T398

Path: Configuration Manager > Protocols > ATM > ATM Signaling

Default: 4

Options: 1 through 24

Function: Defines the Drop Party Sent timer value (in seconds). This timer applies to multipoint connections only and begins when the circuit sends a DROP PARTY message to a party (the receiver of the message) on the network.

The Drop Party Sent timer stops when the circuit receives a DROP PARTY ACKNOWLEDGE message (indicating that the endpoint used for the party has been released), or a RELEASE message (indicating that the endpoint used for the party has been released and there are no remaining parties).

Instructions: Accept the default, 4, or enter a value from 1 through 24.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.34

Parameter: T399

Path: Configuration Manager > Protocols > ATM > ATM Signaling

Default: 14

Options: 1 through 84

Function: Defines the Add Party Sent timer value (in seconds). This timer applies to multipoint connections only and begins when the circuit sends an ADD PARTY message to a party (the receiver of the message) on the network.

The Add Party Sent timer stops when the circuit receives an ADD PARTY ACKNOWLEDGE message (indicating the connection to the party), ADD PARTY REJECT message (indicating the inability to add the party), or a RELEASE message (indicating the inability to add the party and the absence of any remaining parties).

If the timer expires before the circuit receives an ADD PARTY ACKNOWLEDGE, ADD PARTY REJECT, or RELEASE message, the circuit clears the party.

Instructions: Accept the default, 14, or enter a value from 1 through 84.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.35

Parameter: **Num Restarts ReXmitted**

Path: Configuration Manager > Protocols > ATM > ATM Signaling
Default: 3
Options: 1 through 100
Function: Defines the number of RESTART messages retransmitted before the link is considered down.
Instructions: Accept the default, 3, or enter a value from 1 through 100.
MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.36

Parameter: **Num Stat Enquiries ReXmitted**

Path: Configuration Manager > Protocols > ATM > ATM Signaling
Default: 3
Options: 1 through 100
Function: Defines the number of STATUS ENQUIRY messages retransmitted before the link is considered down.
Instructions: Accept the default, 3, or enter a value from 1 through 100.
MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.37

Parameter: **Num Messages/Sec for Call Pacing**

Path: Configuration Manager > Protocols > ATM > ATM Signaling
Default: 2
Options: 0 through 2147483647
Function: Defines the maximum number of signaling messages the interface can transmit per second.
Instructions: Accept the default value, 2, or enter a value from 0 through 2147483647.
MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.7.1.40

ATM ILMI Signaling Parameter Descriptions

ILMI signaling parameters define the SNMP timers and retry limits for registration with the ATM switch. Figure A-6 shows the window sequence for the ILMI category.

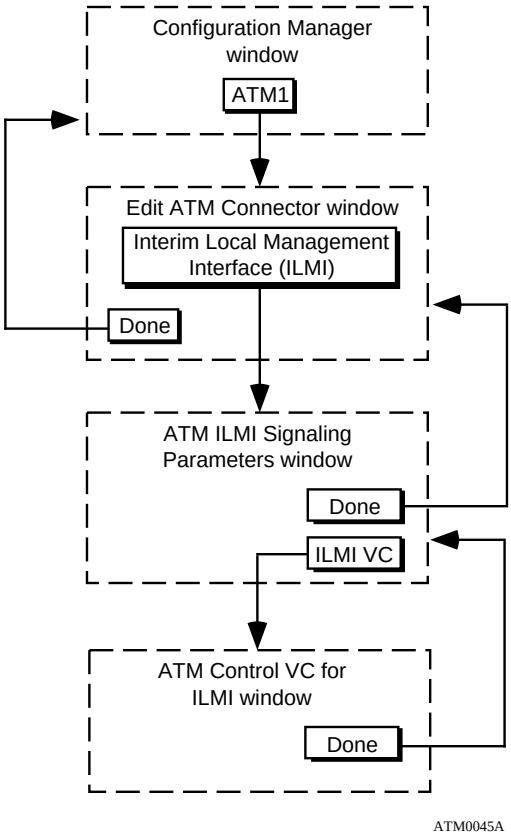

Figure A-6. ATM ILMI Signaling Parameters Window Sequence

For control VC parameter descriptions, refer to “Signaling and ILMI Control VC Parameter Descriptions” later in this chapter.

Parameter: Enable

Path: Configuration Manager > Protocols > ATM > ILMI Signaling
Default: Enable
Options: Enable | Disable
Function: Enables or disables ILMI on this interface.
Instructions: Accept the default, Enable, if you want ILMI to remain enabled on this interface. Select Disable if you do not want ILMI enabled on this interface.
MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.9.1.2

Parameter: ILMI VPI

Path: Configuration Manager > Protocols > ATM > ILMI Signaling
Default: 0
Options: 0 through 255
Function: Defines the virtual path identifier (VPI) for the ILMI VC.
Instructions: Accept the default, 0, or enter a value from 0 through 255
MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.9.1.8

Caution: The signaling VC (0/5) and the ILMI VC (0/16) are reserved. These VCs remain in an operational state as long as signaling is enabled on the ATM interface. Because most ATM devices use these VPI/VCI pairs for signaling, we recommend that you not change these values.

Parameter: ILMI VCI

Path: Configuration Manager > Protocols > ATM > ILMI Signaling
Default: 16
Options: 1 through 65535
Function: Defines the virtual channel identifier (VCI) for the ILMI VC.
Instructions: Accept the default, 16, or enter a value from 1 through 65535.
MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.9.1.9

Caution: The signaling VC (0/5) and the ILMI VC (0/16) are reserved. These VCs remain in an operational state as long as signaling is enabled on the ATM interface. Because most ATM devices use these VPI/VCI pairs for signaling, we recommend that you not change these values.

Parameter: ILMI Get Timer

Path: Configuration Manager > Protocols > ATM > ILMI Signaling
Default: 3
Options: 1 through 120
Function: Defines the ILMI Get Request timer value (in seconds). The Get Request timer sets the amount of time allowed to receive a GET_RESPONSE message after sending a GET_REQUEST message.
Instructions: Accept the default, 3, or enter a value from 1 through 120.
MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.9.1.13

Parameter: ILMI Get Retry Count

Path: Configuration Manager > Protocols > ATM > ILMI Signaling
Default: 3
Options: 1 through 100
Function: Specifies the number of retransmissions of the ILMI GET_REQUEST message before the link is considered down.
Instructions: Accept the default, 3, or enter a value from 1 through 100.
MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.9.1.14

Parameter: ILMI Get Next Timer

Path: Configuration Manager > Protocols > ATM > ILMI Signaling
Default: 3
Options: 1 through 120
Function: Defines the ILMI Get Next Request timer value (in seconds). The Get Next Request timer sets the amount of time allowed to receive a GET_NEXT_RESPONSE message after sending a GET_NEXT_REQUEST message.
Instructions: Accept the default, 3, or enter a value from 1 through 120.
MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.9.1.15

Parameter: ILMI Get Next Retry Count

Path: Configuration Manager > Protocols > ATM > ILMI Signaling
Default: 3
Options: 1 through 100
Function: Specifies the number of retransmissions of the ILMI GET_NEXT_REQUEST message before the link is considered down.
Instructions: Accept the default, 3, or enter a value from 1 through 100.
MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.9.1.16

Parameter: ILMI Set Timer

Path: Configuration Manager > Protocols > ATM > ILMI Signaling
Default: 3
Options: 1 through 120
Function: Defines the ILMI Set Request timer value (in seconds). The Set Request timer sets the amount of time allowed to receive a SET_RESPONSE message after sending a SET_REQUEST message.
Instructions: Accept the default, 3, or enter a value from 1 through 120.
MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.9.1.17

Parameter: **ILMI Set Retry Count**

Path: Configuration Manager > Protocols > ATM > ILMI Signaling

Default: 3

Options: 1 through 100

Function: Specifies the number of retransmissions of the ILMI SET_REQUEST message before the link is considered down.

Instructions: Accept the default, 3, or enter a value from 1 through 100.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.9.1.18

Signaling and ILMI Control VC Parameter Descriptions

The parameters for signaling and ILMI control VCs are identical. For the window sequence to access these control VCs, refer to the sections describing signaling or ILMI parameters earlier in this appendix.

Parameter: **Xmit Peak Cell Rate (cells/s)**

Path: Configuration Manager > Protocols > ATM > ATM Signaling > **Sig VC**

or

Configuration Manager > Protocols > ATM > ILMI Signaling > **ILMI VC**

Default: 4716

Options: 300 through 365566 (ATM FRE2 OC-3 SONET/SDH ILI pairs)
128 through 353207 (ATM ARE OC-3 SONET/SDH ILI pairs and Model 5780 ATM routers)
128 through 96000 (ATM ARE DS-3 ILI pairs)
128 through 80000 (ATM ARE E-3 ILI pairs; G832 Framing Mode)
128 through 72000 (ATM ARE E-3 ILI pairs; G751 Framing Mode)

Function: Specifies the upper traffic limit, in cells/second, that the ATM connection can submit. How you set the peak cell rate depends on

- The optical transmission rate of your ATM device
- The amount of traffic you expect on a particular VC
- The rate you desire for each VC

Instructions: After you determine the transmission rate of your ATM device, set the peak cell rate within the range specified above.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.5.1.8

Parameter: Xmit Sustainable Cell Rate (cells/s)

Path: Configuration Manager > Protocols > ATM > ATM Signaling > **Sig VC**

or

Configuration Manager > Protocols > ATM > ILMI Signaling > **ILMI VC**

Default: 4716

Options: 300 through 365566 (ATM FRE2 OC-3 SONET/SDH ILI pairs)
0, 128 through 353207 (ATM ARE OC-3 SONET/SDH ILI pairs and Model 5780 ATM routers)
0, 128 through 96000 (ATM ARE DS-3 ILI pairs)
0, 128 through 80000 (ATM ARE E-3 ILI pairs; G832 Framing Mode)
0, 128 through 72000 (ATM ARE E-3 ILI pairs; G751 Framing Mode)

Function: Specifies the upper limit of the ATM connection conforming average rate. The average rate equals the total number of cells transmitted, divided by the duration of the connection.

Using the sustainable cell rate (SCR), you can define the future cell flow of a VC in greater detail than by just using the peak cell rate.

For ATM FRE2 ILI pairs, specifying the SCR controls the rate over time -- not at a specific instant of time -- and can help you more efficiently use your network resources.

For ATM ARE ILI pairs and Model 5780 ATM routers, the SCR maps directly to the minimum cell rate (MCR). The MCR defines the minimum amount of guaranteed bandwidth allowed for PVCs and Control VCs on the ATM line.

When setting the SCR for ATM FRE2 ILI pairs, keep the following in mind:

- The SCR is essentially a future average. By setting the SCR you are specifying the cell rate, over time, to which you want the VC to conform.
- To be useful, the SCR must not exceed the PCR.
- If you know the user average rate, set the SCR about 10 percent higher than this value.
- ATM FRE2 ILI pairs require a minimum SCR value of 300 cells/s. PVCs may fail to operate with SCR values less than 300 cells/s.

(continued)

Parameter: Xmit Sustainable Cell Rate (cells/s) *(continued)*

When setting the SCR for ATM ARE ILI pairs and Model 5780 ATM routers, keep the following in mind:

- The SCR maps directly to the MCR.
- The MCR provides guaranteed bandwidth for PVCs and Control VCs while allowing sufficient bandwidth for SVCs to operate.
- To be useful, the SCR must not exceed the PCR.
- If you know the user average rate, set the SCR about 10 percent higher than this value.
- ATM ARE ILI pairs and Model 5780 ATM routers require a minimum SCR value of 128 cells/s. VCs may fail to operate with SCR values less than 128 cells/s.
- ATM ARE ILI pairs and Model 5780 ATM routers allow you to enter an SCR value of 0. Entering 0 for the SCR turns off this function.
- The E-3 framing mode setting affects the maximum SCR.

Instructions: After you determine the transmission rate of your ATM device, set the sustainable cell rate within the range specified under “Options.” For ATM ARE ILI pairs and Model 5780 ATM routers, you can enter 0 to turn off this function.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.5.1.9

Parameter: **Xmit Burst Size (cells)**

Path: Configuration Manager > Protocols > ATM > ATM Signaling > **Sig VC**

or

Configuration Manager > Protocols > ATM > ILMI Signaling > **ILMI VC**

Default: 40

Options: 1 through 65535

Function: For ATM FRE2 ILI pairs, the Maximum Burst Size is the maximum length of a cell stream on a particular VC. The MBS specifies the maximum number of sequential cells allowed on a VC, at the peak cell rate, before the VC must relinquish bandwidth to other VCs.

When setting the MBS, we suggest that you select a value larger than the largest packet your PVC or Control VC can transmit (that is, the Maximum AAL CPCS Transmit SDU Size). For example, if your VC accepts packets that are less than 2358 bytes long (PVC default), set your MBS value from 45 through 50 cells.

Instructions: Set a value in the specified range.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.5.1.10

Caution: ATM ARE ILI pairs and Model 5780 ATM routers ignore the maximum burst size.

Parameter: **Maximum AAL CPCS Transmit SDU Size**

Path: Configuration Manager > Protocols > ATM > ATM Signaling > **Sig VC**

or

Configuration Manager > Protocols > ATM > ILMI Signaling > **ILMI VC**

Default: 4608

Options: 1 through 65535

Function: Specifies the maximum AAL CPCS SDU size, in bytes, that this VC supports in the transmit direction.

Instructions: Enter an octet value that represents the maximum packet size you intend this VC to transmit. We suggest that you accept the default value of 4608 bytes. Most packets fall well within this limit.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.5.1.17

Parameter:	**Maximum AAL CPCS Receive SDU Size**
Path:	Configuration Manager > Protocols > ATM > ATM Signaling > **Sig VC** or Configuration Manager > Protocols > ATM > ILMI Signaling > **ILMI VC**
Default:	4608
Options:	1 through 65535
Function:	Specifies the maximum AAL CPCS SDU size, in bytes, that this VC supports in the receive direction.
Instructions:	Enter an octet value that represents the maximum packet size you intend this VC to receive. We suggest that you accept the default value of 4608 bytes. Most packets fall well within this limit.
MIB Object ID:	1.3.6.1.4.1.18.3.4.23.1.5.1.18

ATM Signaling AAL Parameter Descriptions

Signaling AAL (SAAL) parameters define the connection and timer settings the router uses to maintain a switched connection. SAAL provides reliable transport of signaling messages within the ATM protocol reference model. Figure A-7 shows the window sequence for the SAAL category.

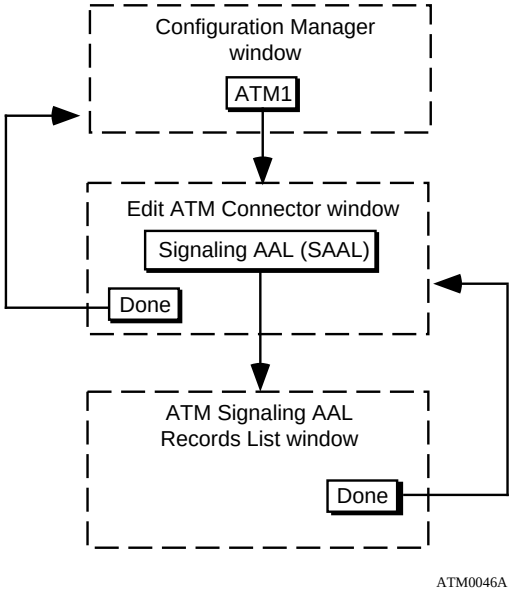

Figure A-7. ATM Signaling AAL Records List Window Sequence

Parameter: Enable

Path: Configuration Manager > Protocols > ATM > Signaling AAL

Default: Enable

Options: Enable | Disable

Function: Enables or disables SAAL on this interface.

Instructions: Accept the default, Enable, if you want SAAL to remain enabled on this interface. Select Disable if you do not want SAAL enabled on this interface.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.8.1.2

Parameter: Link Connection Arbitration

Path: Configuration Manager > Protocols > ATM > Signaling AAL

Default: Active

Options: Active | Passive

Function: Determines whether SAAL initiates link connections or waits for connections.

Instructions: Accept the default, Active, if you want this interface to initiate connections. Select Passive if you do not want this interface to initiate connections.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.8.1.8

Parameter: Poll Timer

Path: Configuration Manager > Protocols > ATM > Signaling AAL

Default: 7

Options: 1 through 120

Function: Defines the Service Specific Connection Oriented Protocol (SSCOP) Poll timer value (in tenths of a second). This value sets the allowable time between Poll Protocol Data Unit (PDU) transmissions.

The Poll timer ensures that the receiver continues to return a solicited status (STAT) PDU to the sender on a regular basis. The timely receipt of STAT PDUs restarts the Poll timer and allows for more efficient transmission error recovery.

Instructions: Accept the default, 7, or enter a value from 1 through 120.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.8.1.9

Parameter: Keep Alive Timer

Path: Configuration Manager > Protocols > ATM > Signaling AAL

Default: 20

Options: 1 through 120

Function: Defines the SSCOP Keep Alive Timer value (in tenths of a second). This value sets the allowable time between POLL PDU transmissions if there are no pending Sequence Data (SD) PDUs.

The keep alive timer is generally greater than the poll timer and greater than the length of one round-trip delay.

Instructions: Accept the default, 20, or enter a value from 1 through 120.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.8.1.10

Parameter: **No Response Timer**

Path: Configuration Manager > Protocols > ATM > Signaling AAL

Default: 70

Options: 1 through 120

Function: Defines the SSCOP No Response Timer value (in tenths of a second). This value sets the allowable time between the receipt of STAT PDUs.

So as not to interrupt the flow of data, the SSCOP does not require a reply to every POLL PDU. This can cause problems in detecting a broken connection. To alleviate this problem, the no response timer runs parallel to the poll timer. If both the no response timer and the poll timer expire, the SSCOP clears the connection.

The No Response Timer value must equal at least the sum of the keep alive timer plus the length of one round-trip delay.

Instructions: Accept the default, 70, or enter a value from 1 through 120.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.8.1.11

Parameter: **Connection Control Timer**

Path: Configuration Manager > Protocols > ATM > Signaling AAL

Default: 10

Options: 1 through 120

Function: Defines the SSCOP Connection Control Timer value (in tenths of a second). This value sets the allowable time between the transmission of BGN, END, resynchronization (RS), and error recovery (ER) PDUs, so long as the sender has not received an acknowledgment to any of these PDUs.

The CC timer must equal at least the length of one round-trip delay.

Instructions: Accept the default, 10, or enter a value from 1 through 120.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.8.1.12

Parameter: Max Connection Control

Path: Configuration Manager > Protocols > ATM > Signaling AAL

Default: 4

Options: 1 through 20

Function: Defines the SSCOP Maximum Connection Control value. This value sets the maximum number of times the sender can transmit a BGN, END, RS, or ER PDU.

Instructions: Accept the default, 4, or enter a value from 1 through 20.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.8.1.13

Parameter: Max PD Before Poll

Path: Configuration Manager > Protocols > ATM > Signaling AAL

Default: 25

Options: 1 through 120

Function: Defines the SSCOP Maximum Poll Data (PD) value. This value sets the maximum value of the poll data state variable before transmitting a POLL PDU. The poll data state variable increments upon transmission of a sequenced data (SD) PDU and resets to zero upon transmission of a POLL PDU.

Instructions: Accept the default, 25, or enter a value from 1 through 120.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.8.1.14

Parameter: Max STAT PDU Elements

Path: Configuration Manager > Protocols > ATM > Signaling AAL

Default: 67

Options: Odd integers from 3 through 119

Function: Defines the SSCOP Maximum STAT value. This value sets the maximum number of list elements allowed in a STAT PDU.

The sending device uses the value of this parameter for segmentation purposes. When the number of list elements exceeds the Max STAT value, the STAT message segments. As a general rule, the default value, 67, causes the STAT PDU to fill six ATM cells using AAL 5.

Instructions: Accept the default, 67, or enter an odd integer from 3 through 119.

MIB Object ID: 1.3.6.1.4.1.18.3.4.23.1.8.1.15

ATMARP Configuration Parameter Descriptions

This section describes ATM-specific IP parameters for implementing Classical IP over ATM. For additional information about ATMARP, refer to *Configuring IP Services*.

Parameter: ATM ARP Mode

Path: Configuration Manager > Protocols > IP > Interfaces
Default: Client
Options: Client | Server
Function: Specifies whether ATMARP is running as a client or server on this interface.
Instructions: You must configure one ATMARP server for each LIS you define.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.2.1.4.1.112

Parameter: ARP Server ATM Address Network Prefix

Path: Configuration Manager > Protocols > IP > Interfaces
Default: None
Options: XX00000000000000000000000000 to XXFFFFFFFFFFFFFFFFFFFFFFFF

where XX = 39, 45, or 47

Function: Defines the ATM address network prefix of the ATMARP server on your network.

The XX byte must contain 39, 45, or 47. These values define the authority and format identifier (AFI). The AFI byte identifies the group responsible for allocating the prefix and the format the prefix uses. For more information about the AFI byte, refer to the ATM Forum *ATM User-Network Interface Specification* (Version 3.0).

The network prefix and the user part form a complete ATM address.

Instructions: Enter the ATM address network prefix of the ATMARP server on your network.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.2.1.4.1.113

Parameter:	**ARP Server ATM Address User Part**
Path:	Configuration Manager > Protocols > IP > Interfaces
Default:	None
Options:	00000000000000 to FEFFFFFFFFFFFF
Function:	Defines the user part (suffix) of the ATM address for the ATMARP server on your network. The user part suffix consists of a 6-byte endstation identifier and a 1-byte selector field. The user part and the network prefix form a complete ATM address.
Instructions:	Enter the ATM address user part of the ATMARP server for your network.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.2.1.4.1.113

Adjacent Host Parameter Descriptions

This section describes ATM IP parameters for creating adjacent hosts in a Classical IP over ATM environment. For additional information about adjacent hosts, refer to *Configuring IP Services*.

Parameter:	**Enable**
Path:	Configuration Manager > Protocols > IP > Adjacent Hosts
Default:	Enable
Options:	Enable | Disable
Function:	Specifies the state (active or inactive) of the adjacent host in the IP routing tables.
Instructions:	Select Disable to make the adjacent host record inactive in the IP routing table; the IP router will not consider this adjacent host. Select Enable to make the adjacent host record active again in the IP routing table.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.2.1.6.1.2

Parameter: **IP Adjacent Host Address**

Path: Configuration Manager > Protocols > IP > Adjacent Hosts

Default: None

Options: Any valid IP address

Function: Specifies the IP address of the device that you want to configure as an adjacent host.

Instructions: Enter the IP address in dotted decimal notation.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.2.1.6.1.3

Parameter: **Next Hop Interface Addr**

Path: Configuration Manager > Protocols > IP > Adjacent Hosts

Default: 0.0.0.0

Options: Any valid IP address

Function: Specifies the IP address of the router's network interface to the adjacent host.

Instructions: Enter the IP address in dotted decimal notation.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.2.1.6.1.4

Parameter: **MAC Address**

Path: Configuration Manager > Protocols > IP > Adjacent Hosts

Default: None

Options: Depend on the data link you have selected

Function: Specifies the MAC address of the adjacent host. This value can be

- A 48-bit physical address
- A 64-bit SMDS address
- An ATM VPI/VCI pair (for ATM PVCs)
- The ATM address of the ATM interface (for ATM SVCs)

Instructions: Enter the MAC address as a 12-digit hexadecimal number (canonical format), a 32-digit hexadecimal number (switched multimegabit data services [SMDS]), a VPI/VCI pair *(*for example, 0/32), or a 40-digit ATM address (for example, 39000000000000000000000000000A20037B801).

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.2.1.6.1.6

Parameter: Host Encapsulation

Path: Configuration Manager > Protocols > IP > Adjacent Hosts

Default: Ethernet

Options: Ethernet │ SNAP │ PDN │ DDN │ SNAPIP │ NULL

Function: Specifies the adjacent host's encapsulation method.

Instructions: Select Ethernet or SNAP (Subnetwork Access Protocol) if you are defining a point-to-point network interface, or if the adjacent host resides on an Ethernet. For an X.25 interface, select Public Data Network (PDN) or Defense Data Network (DDN). For an adjacent host on an ATM logical IP subnet, select SNAP. (SNAPIP and NULL also specify host encapsulation methods for ATM networks.)

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.2.1.6.1.7

Parameter: Adjacent Host X.121 Address

Path: Configuration Manager > Protocols > IP > Adjacent Hosts

Default: None

Options: Any valid X.121 address

Function: Specifies the X.121 address of the adjacent host.

Instructions: Ignore this parameter. You specify an X.121 address only if this is a PDN/X.25, DDN/X.25, or Blacker front-end encryption (BFE)/X.25 connection.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.2.1.6.1.9

IP Interface Parameter Descriptions

This section describes ATM IP parameters for implementing Classical IP over ATM. For additional information about ATMARP, refer to *Configuring IP Services*.

Parameter: ATM ARP Mode

Path: Configuration Manager > Protocols > IP > Interfaces
Default: Client
Options: Client | Server
Function: Specifies whether the router is running as an ATM client or server on this interface.
Instructions: You must configure one ATMARP server for each LIS you define.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.2.1.4.1.112

Parameter: ARP Server ATM Address Network Prefix

Path: Configuration Manager > Protocols > IP > Interfaces
Default: None
Options: XX00000000000000000000000 to XXFFFFFFFFFFFFFFFFFFFFFF
where XX = 39, 45, or 47
Function: Defines the ATM address network prefix of the ATMARP server on your network.
Instructions: Enter the ATM address network prefix of the ATMARP server on your network. A complete ATM address consists of a network prefix and a user part. Use the ARP Server ATM Address User Part parameter to supply the user part of the ATM address.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.2.1.4.1.113

Parameter: ARP Server ATM Address User Part

Path: Configuration Manager > Protocols > IP > Interfaces

Default: None

Options: XX00000000000000 to FEFFFFFFFFFFF

Function: Defines the user part (suffix) of the ATM address for the ATMARP server on your network. The user part suffix consists of a 6-byte endstation identifier and a 1-byte selector field.

Instructions: Enter the user part suffix of the ATMARP server on your network. A complete ATM address consists of a network prefix and a user part. Use the ARP Server ATM Address Network Prefix parameter to supply the network part of the ATM address.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.2.1.4.1.113

Parameter: Registration Refresh Interval

Path: Configuration Manager > Protocols > IP > Interfaces

Default: 900 seconds for a client
1200 seconds for a server

Options: Any interval (in seconds)

Function: For a client, this parameter specifies the interval between registration refreshes. For a server, this parameter specifies the duration for which the registration is valid.

Instructions: Determine if ATMARP is running as a client or server on this interface and enter an appropriate value.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.2.1.4.1.115

Appendix B
Site Manager Default Settings for ATM

This appendix lists the Site Manager default parameter settings for ATM. You can use the Configuration Manager to edit any default settings listed here.

Table B-1. Initial ATM Signaling Config Window

Parameter	Default
Enable ATM Signaling	Enable
Max Number of SVC Applications	20
Max Point to Point Connections	1000
Max Point to Multipoint Connections	40
Max Parties in Multipoint Connections	1

Table B-2. ATM Service Records List Window

Parameter	Default
Enable/Disable	Enable
User Part Autogeneration	Enable
ATM Addr User Part	None
ATM Addr Net Prefix (Optional)	None
MTU	4608

Table B-3. ATM Service Record Parameters Window

Parameter	Default
Data Encapsulation Type	LANE (signaling enabled) or LLC/SNAP (signaling disabled)
Virtual Connection Type	SVC (signaling enabled) or PVC (signaling disabled)
User Part Autogeneration	Enable
ATM Addr User Part	None
ATM Addr Net Prefix (Optional)	None
Emulated LAN Name	Default ELAN
Emulated LAN Type	Unspecified

Table B-4. ATM Virtual Channel Link Window

Parameter	Default
Hybrid/Bridged VC	No
Administrative State	Up
Xmit Peak Cell Rate (cells/s)	2358
Xmit Sustainable Cell Rate (cells/s)	2358
Xmit Burst Size (cells)	40
Maximum AAL CPCS Transmit SDU Size	4608
Maximum AAL CPCS Receive SDU Size	4608
Data Encapsulation Type	LLC/SNAP

Table B-5. ATM Virtual Channel Link Parameters Window

Parameter	Default
VPI Number	None
VCI Number	None

Table B-6. LAN Emulation Parameters Window

Parameter	Default
Enable	Enable
Owner	None
Configuration Mode	Automatic
Emulated LAN Type	Unspecified
Maximum Data Frame Size	Unspecified
Emulated LAN Name	Default ELAN
LE Server ATM Address	None
Control Timeout	5
Max Unknown Frame Count	1
Max Unknown Frame Time	1
VCC Timeout Period Enable	Enable
Max Retry Count	1
Aging Time	300
Forward Delay Time	15
Expected LE_ARP Response Time	3
Flush Timeout	4
Path Switching Delay	6
Flush Protocol	Enable
LE Config Server ATM Address	None

Table B-7. ATM Interface Attributes Window

Parameter	Default
Administrative State	Up
Enable ATM Signaling	Enable
Use Hardware MAC Address	Enable
MAC Address Override	None

ATM FRE2 Line Parameters

Table B-8. ATM FRE2 Line Parameters

Parameter	Default
Enable	Enable
Data Path Notify	Enable
Data Path Notify Timeout	3 s
SVC Inactivity Timeout Enable	Enable
SVC Inactivity Timeout (Secs)	1200 s

Table B-9. ATM FRE2 Physical Attribute Parameters

Parameter	Default
Framing Mode	SONET
Scrambling	Enable
Loopback	Disable
Cell Insertion	Unassigned

ATM ARE Line Parameters

Table B-10. ATM ARE Line Parameters

Parameter	Default
Enable	Enable
Interface MTU	4608
Data Path Enable	Enable
Data Path Notify Timeout	1 s
SVC Inactivity Timeout Enable	Enable
SVC Inactivity Timeout (Secs)	1200 s
Framing Mode	SONET
Clocking Signal Source	Internal

Table B-10. ATM ARE Line Parameters *(continued)*

Parameter	Default
DS3 Line Build Out	Short
DS3 Scrambling	On

Table B-11. ATM Signaling Parameters Window

Parameter	Default
Enable	Enable
Protocol Standard	UNI_V30
Max Number of SVC Applications	20
Max Point to Point Connections	1000
Max Point to Multipoint Connections	40
Max Parties in Multipoint Connections	1
Min Memory Threshold	20%
VPI	0
VCI	5
T303	4
T308	30
T309	10
T310	10
T313	4
T316	120
T316c	120
T322	4
TDisc	4
T398	4
T399	14
Num Restarts Permitted	3
Num Stat Enquiries Permitted	3
Num Messages/Sec for Call Pacing	2

Table B-12. ATM Control VC for Signaling Window

Parameter	Default
Xmit Peak Cell Rate (cells/s)	4716
Xmit Sustainable Cell Rate (cells/s)	4716
Xmit Burst Size (cells)	40
Maximum AAL CPCS Transmit SDU Size	4608
Maximum AAL CPCS Receive SDU Size	4608

Table B-13. ATM Signaling AAL Records List Window

Parameter	Default
Enable	Enable
Link Connection Arbitration	Active
Poll Timer	7
Keep Alive Timer	20
No Response Timer	70
Connection Control Timer	10
Max Connection Control	4
Max PD Before Poll	25
Max Stat PDU Elements	67

Table B-14. ATM ILMI Signaling Parameters Window

Parameter	Default
Enable	Enable
ILMI VPI	0
ILMI VCI	16
ILMI Get Timer	3
ILMI Get Retry Count	3
ILMI Get Next Timer	3
ILMI Get Next Retry Count	3
ILMI Set Timer	3
ILMI Set Retry Count	3

Table B-15. ATM Control VC for ILMI Window

Parameter	Default
Xmit Peak Cell Rate (cells/s)	4716
Xmit Sustainable Cell Rate (cells/s)	4716
Xmit Burst Size (cells)	40
Maximum AAL CPCS Transmit SDU Size	4608
Maximum AAL CPCS Receive SDU Size	4608

Table B-16. ATM ARP Configuration Window

Parameter	Default
ATM ARP Mode	Client
ARP Server ATM Address Network Prefix	None
ARP Server ATM Address User Part	None

Appendix C
ATM Sample Log

The following log provides an example of a working ATM Ethernet LANE configuration. To generate this level of message detail, enable extended debugging in the *wfAtmSigEntry* and *wfAtmIlmiEntry* MIB objects.

Note: The messages in this example log file may change with subsequent releases of software.

```
[2:1]$ g wfAtmIlmiEntry.wfAtmIlmiDebug.*
wfAtmIlmiEntry.wfAtmIlmiDebug.1405101 = 6

[2:1]$ g wfAtmSscopEntry.wfAtmSscopDebug.*
wfAtmSscopEntry.wfAtmSscopDebug.1405101 = 6

[2:1]$ g wfAtmSigEntry.wfAtmSigDebug.*
wfAtmSigEntry.wfAtmSigDebug.1405101 = 6

[2:1]$ g wfAtmInterfaceConfEntry.wfAtmInterfaceDebug.*
wfAtmInterfaceConfEntry.wfAtmInterfaceDebug.1405101 = 6

[2:1]$ g wfAtmLecConfigEntry.29.3
wfAtmLecConfigEntry.wflecDebugLevel.3 = 15

[2:1]$ log -ftwifd -eATMINTF -eATM -eATM_SIG -eATM_LE

#1: 11/03/95 11:44:48.652   INFO     SLOT  5  ATMINTF          Code:  11
Coprocessor image atmc.exe loaded on link module (26334 bytes).

#2: 11/03/95 11:44:48.660   DEBUG    SLOT  5  ATMINTF          Code: 167
Port 1: framer up. (id/type 0x30)

#3: 11/03/95 11:44:48.660   INFO     SLOT  5  ATMINTF          Code:  14
Port 1: framer device initialization complete.
```

```
#4: 11/03/95 11:44:49.617   INFO      SLOT  5  ATMINTF          Code:   3
Service initializing.

#5: 11/03/95 11:44:50.605   WARNING   SLOT  5  ATMINTF          Code:  20
Port 1: not verified with diagnostic.

#6: 11/03/95 11:44:50.609   DEBUG     SLOT  5  ATMINTF          Code: 151
ATMizer driver control structures
   RX anchor 0x80000080, RX cmds 0x800000c0, RX log 0x800010c0
   TX anchor 0x800000a0, TX cmds 0x800012c0, TX log 0x800022c0

#7: 11/03/95 11:44:54.191   DEBUG     SLOT  5  ATMINTF          Code: 130
RX ATMizer image download complete

#8: 11/03/95 11:44:54.480   DEBUG     SLOT  5  ATMINTF          Code: 131
TX ATMizer image download complete

#9: 11/03/95 11:44:54.480   INFO      SLOT  5  ATMINTF          Code:  13
Port 1: SAR device initialization complete.

#10: 11/03/95 11:44:54.484 DEBUG     SLOT  5  ATMINTF          Code: 129
Using default ATMizer buffering thresholds
Port 1: cfg: ix 1405101 alm 1 frm 2 clk 1 ver 0 cct 2

#11: 11/03/95 11:44:54.484 INFO      SLOT  5  ATMINTF          Code:   4
Port 1: service available.

#12: 11/03/95 11:44:54.488 DEBUG     SLOT  5  ATMINTF          Code: 169
Port 1: cfg resets mib

#13: 11/03/95 11:44:56.335   INFO      SLOT  5  ATM_LE          Code:   2
Slot 5 : ATM Lan Emulation provided.

#14: 11/03/95 11:44:57.132   INFO      SLOT  5  ATM             Code:   1
Slot 5 : ATM Service provided.

#15: 11/03/95 11:44:57.601 INFO      SLOT  5  ATMINTF          Code:  10
Port 1: data path service available.

**************************************************************************
The ATM module has successfully completed its initialization process, has
started, and is available for use.
**************************************************************************

#16: 11/03/95 11:44:57.605   DEBUG     SLOT  5  ATM             Code:  47
Signalling not loaded..Going into wait state
```

```
#17: 11/03/95 11:44:58.878   DEBUG     SLOT  5  ATM             Code:  47
Signalling came alive

#18: 11/03/95 11:44:58.882   DEBUG     SLOT  5  ATM             Code:  47
Changing to signalling wait state

#19: 11/03/95 11:44:58.882 INFO      SLOT  5  ATM_SIG          Code:   3
Line 1405101:  ATM Signaling initiating.

#20: 11/03/95 11:44:58.894 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: ATM VC Reserve Response
FSM atmlmst_sig_rr: call_ref=1, State=RESERVE WAIT,
Event=ATM_VC_RESERVE_RSP_MSG

#21: 11/03/95 11:44:58.894 INFO      SLOT  5  ATMINTF          Code:  15
Port 1: virtual channel VPI=0/VCI=5 (call reference 1) activated.

#22: 11/03/95 11:44:58.894 DEBUG     SLOT  5  ATM_SIG          Code:  24
FSM atmlmst_sig_rr: call_ref=2, State=RESERVE WAIT,
Event=ATM_VC_RESERVE_RSP_MSG

#23: 11/03/95 11:44:58.898 INFO      SLOT  5  ATMINTF          Code:  15
Port 1: virtual channel VPI=0/VCI=16 (call reference 2) activated.

#24: 11/03/95 11:44:58.898 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: DP VC LINE Message
FSM atmlmst_rcp_dvl: call_ref=1, State=DP VC LINE WAIT,
Event=ATM_OPEN_VC_RESP
ATM Layer Manager Inbound: DP VC LINE Message
FSM atmlmst_rcp_dvl: call_ref=2, State=DP VC LINE WAIT,
Event=ATM_OPEN_VC_RESP
ATM Layer Manager Inbound: VC MOD RESPONSE Message
FSM atmlmst_sig_vmr: call_ref=1, State=VC_MOD_MSG WAIT, Event=VC_MOD_RSP

*************************************************************************
```

The VCCs for signaling (0/5) and ILMI (0/16) automatically activate.

```
*************************************************************************

Configuring layer 2 (Q.SAAL) - General

Configuring SAP 0 of layer 2 (Q.SAAL)

*************************************************************************
```

Q.SAAL is a reliable transport mechanism used by signaling (SAAL: signaling ATM adaptation layer)

```
*************************************************************************
```

```
#25: 11/03/95 11:44:58.902 DEBUG     SLOT  5  ATM_SIG          Code:  24
FSM atmlmst_sig_vmr: call_ref=2, State=VC_MOD_MSG WAIT, Event=VC_MOD_RSP
Configuring layer 2 (UME) - General

Configuring SAP 0 of layer 2 (UME)

**************************************************************************
UME refers to ILMI
**************************************************************************

#26: 11/03/95 11:44:58.917 DEBUG     SLOT  5  ATM_SIG          Code:  24
[UME User] General Configuration

Configuring SAP 0 of layer 3

#27: 11/03/95 11:44:58.921 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: SSCOP Status Indication

#28: 11/03/95 11:44:58.925 DEBUG     SLOT  5  ATM_SIG          Code:  24
SSCOP Status Indication(su=0,ev=3,ui=3,sscf=3,sscop=3,li=3)

#29: 11/03/95 11:44:58.925 INFO      SLOT  5  ATM_SIG          Code:   5
Line 1405101:  ATM SSCOP active.

#30: 11/03/95 11:44:58.925 DEBUG     SLOT  5  ATM_SIG          Code:  24
SSCOP Status Indication: PROT_ST_UP

**************************************************************************
Signaling uses SSCOP over VCC 0/5.  Q.SAAL is composed of SSCOP and SSCS
(Service Specific Convergence Sublayer).  If the log message "SSCOP Status
Indication:PROT_ST_DN" appears, the SSCOP process is not operating on the
router and the router clears all the SVCs.
**************************************************************************

#31: 11/03/95 11:44:58.941 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: ILMI Connection Indication

#32: 11/03/95 11:44:58.949 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: ILMI Connection Confirm
ATM Layer Manager Inbound: ILMI Status Indication
ILMI Status Indication (su=0,ev=3,ui=3,ume=2,li=2)

ILMI Status Indication: PROT_ST_UP
```

```
#33: 11/03/95 11:44:58.949 INFO      SLOT  5  ATM_SIG          Code:   6
Line 1405101:  ATM ILMI active.
Line 1405101:  ATM Signaling active.

**************************************************************************
```

ILMI and signaling router processes are operational, and the router has established ILMI signaling communication with the switch.

```
**************************************************************************

#34: 11/03/95 11:44:58.949   DEBUG     SLOT  5  ATM              Code:  47
Spawning PVC Manager......

**************************************************************************
```

The PVC Manager spawns whether or not you define PVCs.

```
**************************************************************************

#35: 11/03/95 11:44:58.953 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: ILMI Statistics Confirm
ATM Layer Manager Inbound: ILMI Status Confirm

#36: 11/03/95 11:44:58.957 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Address Registration Request
mu_proc_addr_reg_msg(): received register request for unregistered
network prefi

#37: 11/03/95 11:44:58.957   INFO      SLOT  5  ATM              Code:   2
Line 1405101 : ATM Service activated on Interface.

#38: 11/03/95 11:44:58.960   DEBUG     SLOT  5  ATM              Code:  47
Atm Address Registration Failed
Line 1405101, cct 3, Address 00000003 00000004 00000017 00000001
00000002

#39: 11/03/95 11:44:59.039 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: ILMI Add Indication

#40: 11/03/95 11:44:59.042 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Address Registration Request

#41: 11/03/95 11:44:59.210 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: ILMI Add Confirm
Succeeded to register address: 39000000 00000000 00000000 000000a2
0e9fca00
```

```
#42: 11/03/95 11:44:59.210   DEBUG     SLOT  5  ATM             Code:  47
Atm Address Registration Successful
Line 1405101, cct 3, Address 39000000 00000000 00000000 000000a2
0e9fca00
```

****

The ATM address defined in the router ATM service record has been registered with the ATM switch. The router received the prefix 39000000000000000000000000 from the switch. If you define the prefix in the service record, the prefix you define overrides what the router receives from the switch.

****

```
#43: 11/03/95 11:44:59.214   INFO      SLOT  5  ATM_LE          Code:   6
Line 1405101 : Circuit 3 : ATM LEC received DP_LINE message.

#44: 11/03/95 11:44:59.218   INFO      SLOT  5  ATM_LE          Code:   3
Line 1405101 : Circuit 3 : ATM LEC initializing.

#45: 11/03/95 11:44:59.308 TRACE     SLOT  5  ATM_LE          Code:  41
LEC: Calling SIG_Bind(LE_CTRL): cct 3 bind_id 0

#46: 11/03/95 11:44:59.308 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Bind Request

#47: 11/03/95 11:44:59.312 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Outbound: Bind Request
ATM Layer Manager Outbound: Bind Confirm

#48: 11/03/95 11:44:59.312 TRACE     SLOT  5  ATM_LE          Code:  41
LEC: Calling SIG_Bind(LE_8023_MCAST): cct 3 bind_id 2

#49: 11/03/95 11:44:59.316 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Bind Request
ATM Layer Manager Outbound: Bind Request
ATM Layer Manager Outbound: Bind Confirm

#50: 11/03/95 11:44:59.320 TRACE     SLOT  5  ATM_LE          Code:  38
Line 1405101 : Circuit 3 : ATM LEC Control SAP binding complete.
LEC: Calling SIG_Register(CPN): cct 3 bind_id 0 sig_id 1 reg_id 0

#51: 11/03/95 11:44:59.320 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Register Request
ATM Layer Manager Outbound: Register Confirm

#52: 11/03/95 11:44:59.320 TRACE     SLOT  5  ATM_LE          Code:  41
LEC: Calling SIG_Register(BLLI): cct 3 bind_id 0 sig_id 1 reg_id 1
```

```
#53: 11/03/95 11:44:59.320 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Register Request

#54: 11/03/95 11:44:59.324 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Outbound: Register Confirm

#55: 11/03/95 11:44:59.324 TRACE     SLOT  5  ATM_LE           Code:  41
LEC: Transitioning into the ATM_LEC_INITIAL state for cct 3
Line 1405101 : Circuit 3 : ATM LEC MCast SAP binding complete.
LEC: Calling SIG_Register(CPN): cct 3 bind_id 2 sig_id 2 reg_id 2

#56: 11/03/95 11:44:59.324 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Register Request
ATM Layer Manager Outbound: Register Confirm

#57: 11/03/95 11:44:59.328 TRACE     SLOT  5  ATM_LE           Code:  41
LEC: Calling SIG_Register(BLLI): cct 3 bind_id 2 sig_id 2 reg_id 3

#58: 11/03/95 11:44:59.328 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Register Request
ATM Layer Manager Outbound: Register Confirm

#59: 11/03/95 11:44:59.328 TRACE     SLOT  5  ATM_LE           Code:  35
Line 1405101 : Circuit 3 : ATM LEC Control SAP register confirm for
reg_id 0.
Line 1405101 : Circuit 3 : ATM LEC Control SAP register confirm for
reg_id 1.

#60: 11/03/95 11:44:59.328 DEBUG     SLOT  5  ATM_LE           Code:  45
LEC API msg: LE Create Response from LEC #3 UserHandle 15592560  TransId
0000000

#61: 11/03/95 11:44:59.332 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: OPEN VC REQ

#62: 11/03/95 11:44:59.332 TRACE     SLOT  5  ATM_LE           Code:  41
LEC: Called SIG_Open_VC: cct 3 call_ref 3 sig_id 1
LEC: Transitioning into the ATM_LEC_LECSCONNECT state for cct 3
Line 1405101 : Circuit 3 : ATM LEC MCast SAP register confirm for
reg_id 2.
Line 1405101 : Circuit 3 : ATM LEC MCast SAP register confirm for
reg_id 3.
```

****

The LAN emulation code is requesting that the signaling code open up a VCC to the LECS for the Config Direct VCC.

****

```
#63: 11/03/95 11:44:59.332   DEBUG SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: ATM VC Reserve Response
FSM atmlmst_cing_rr: call_ref=3, State=RESERVE WAIT,
Event=ATM_VC_RESERVE_RSP_MS

#64: 11/03/95 11:44:59.335 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Outbound: Connect Request

#65: 11/03/95 11:44:59.917 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: SSCOP Status Indication
SSCOP Status Indication(su=0,ev=4,ui=1,sscf=0,sscop=0,li=3)
SSCOP Status Indication: PROT_ST_DN

ATM Layer Manager Inbound: Signalling Release Indication
FSM atmlmst_tri_nws: call_ref=3, State=NETWORK WAIT, Event=AMUIAMTRELIND
ATM Release request: call_ref = 3 cid = 5 vpi/vci = 0/0
ATM Layer Manager Inbound: ATM VC Release Response
ATM Layer Manager Outbound: Close Indication

#66: 11/03/95 11:44:59.917 WARNING   SLOT  5  ATM_LE           Code:  27
Line 1405101 : Circuit 3 : ATM LEC Close Indication call_ref 3 cause
value 41

#67: 11/03/95 11:44:59.921 WARNING   SLOT  5  ATM_LE           Code:  34
LEC: could not open Config Direct VCC - reason (3)

**************************************************************************
```

The LE client could not open the Config Direct VCC. Cause value 41 (in line #66) indicates a temporary failure. Cause values are defined in the "cause" section of the ATM UNI specification. In line #67, reason (3) indicates an LE client close reason was LE_SIGREASON_OTHER (probably because SSCOP is not currently operating; line 65 indicates SSCOP is not operating).

```
**************************************************************************

#68: 11/03/95 11:44:59.921 DEBUG     SLOT  5  ATM_LE           Code:  45
LEC API msg: LE Config Response from LEC #3 UserHandle 15592560  TransId
00ef6ee

#69: 11/03/95 11:45:01.929 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: OPEN VC REQ

#70: 11/03/95 11:45:01.929 TRACE     SLOT  5  ATM_LE           Code:  41
LEC: Called SIG_Open_VC: cct 3 call_ref 4 sig_id 1
```

```
#71: 11/03/95 11:45:01.929 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: ATM VC Reserve Response
FSM atmlmst_cing_rr: call_ref=4, State=RESERVE WAIT,
Event=ATM_VC_RESERVE_RSP_MS
ATM Layer Manager Outbound: Connect Request

#72: 11/03/95 11:45:01.933 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Signalling Release Indication
FSM atmlmst_tri_nws: call_ref=4, State=NETWORK WAIT, Event=AMUIAMTRELIND
ATM Release request: call_ref = 4 cid = 6 vpi/vci = 0/0
ATM Layer Manager Inbound: ATM VC Release Response
ATM Layer Manager Outbound: Close Indication

#73: 11/03/95 11:45:01.933 WARNING   SLOT  5  ATM_LE           Code:  27
Line 1405101 : Circuit 3 : ATM LEC Close Indication call_ref 4 cause
value 27
LEC: could not open Config Direct VCC - reason (3)

#74: 11/03/95 11:45:01.933 DEBUG     SLOT  5  ATM_LE           Code:  45
LEC API msg: LE Config Response from LEC #3 UserHandle 15592560  TransId
00ef6ee

#75: 11/03/95 11:45:05.914 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: OPEN VC REQ

#76: 11/03/95 11:45:05.914 TRACE     SLOT  5  ATM_LE           Code:  41
LEC: Called SIG_Open_VC: cct 3 call_ref 5 sig_id 1

#77: 11/03/95 11:45:05.914 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: ATM VC Reserve Response
FSM atmlmst_cing_rr: call_ref=5, State=RESERVE WAIT,
Event=ATM_VC_RESERVE_RSP_MS
ATM Layer Manager Outbound: Connect Request

#78: 11/03/95 11:45:05.917 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Signalling Release Indication
FSM atmlmst_tri_nws: call_ref=5, State=NETWORK WAIT, Event=AMUIAMTRELIND
ATM Release request: call_ref = 5 cid = 7 vpi/vci = 0/0
ATM Layer Manager Inbound: ATM VC Release Response
ATM Layer Manager Outbound: Close Indication

#79: 11/03/95 11:45:05.917 WARNING   SLOT  5  ATM_LE           Code:  27
Line 1405101 : Circuit 3 : ATM LEC Close Indication call_ref 5 cause
value 27
LEC: could not open Config Direct VCC - reason (3)
```

```
#80: 11/03/95 11:45:05.917 DEBUG     SLOT  5  ATM_LE           Code:  45
LEC API msg: LE Config Response from LEC #3 UserHandle 15592560  TransId
00ef6ee

#81: 11/03/95 11:45:10.925 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: SSCOP Status Indication
SSCOP Status Indication(su=0,ev=3,ui=3,sscf=3,sscop=3,li=3)

#82: 11/03/95 11:45:10.925 INFO      SLOT  5  ATM_SIG          Code:   5
Line 1405101:  ATM SSCOP active.

#83: 11/03/95 11:45:10.925 DEBUG     SLOT  5  ATM_SIG          Code:  24
SSCOP Status Indication: PROT_ST_UP

************************************************************************
SSCOP becomes operational again. Switched VCs can now open successfully.
************************************************************************

#84: 11/03/95 11:45:13.929 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: OPEN VC REQ

#85: 11/03/95 11:45:13.929 TRACE     SLOT  5  ATM_LE           Code:  41
LEC: Called SIG_Open_VC: cct 3 call_ref 6 sig_id 1

#86: 11/03/95 11:45:13.929 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: ATM VC Reserve Response
FSM atmlmst_cing_rr: call_ref=6, State=RESERVE WAIT,
Event=ATM_VC_RESERVE_RSP_MS
ATM Layer Manager Outbound: Connect Request

#87: 11/03/95 11:45:14.949 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Signalling Connection Status Indication

#88: 11/03/95 11:45:14.976 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Signalling Connection Confirm
FSM atmlmst_cing_tcc: call_ref=6, State=NETWORK WAIT,
Event=AMUIAMTCONCFM

#89: 11/03/95 11:45:14.984   INFO      SLOT  5  ATM              Code:   8
Line 1405101 : vpi/vci 0/32 has been activated.

************************************************************************
The router successfully opened the VCC that the Config Direct VC uses.
************************************************************************

#90: 11/03/95 11:45:14.984 INFO      SLOT  5  ATMINTF          Code:  15
Port 1: virtual channel VPI=0/VCI=32 (call reference 6) activated.
```

```
#91: 11/03/95 11:45:14.984 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: VC MOD RESPONSE Message
FSM atmlmst_cing_vmr: call_ref=6, State=VC_MOD_MSG WAIT,
Event=VC_MOD_RSP
ATM Layer Manager Outbound: Open Confirm

#92: 11/03/95 11:45:14.984 DEBUG     SLOT  5  ATM_LE           Code:  45
LEC: opened Config Direct VCC (0/32)

LEC: Control Packet -

   Opcode:     CONFIG
      Req_Type:    REQUEST

#93: 11/03/95 11:45:14.988 DEBUG     SLOT  5  ATM_LE           Code:  45
   Transaction_Id: 00fb7b60   Requestor LECID: 0000   Flags: 0000

   Lan Type:     Unspec
    Max Frame Size:     Unspec

   Lan Name: -------

   Targ ATM Address: 000000000000000000000000000-000000000000/00
  Dest LAN: ----

   Src ATM Address:  39000000000000000000000000-0000a20e9fca/00
  Src LAN:  00:00:a2:0e:9f:ca

**************************************************************************
The destination address is not complete.  However, the request is destined for
the well-known LECS address as defined in the ATM Forum LAN Emulation over
ATM specification.
**************************************************************************

#94: 11/03/95 11:45:14.988 TRACE     SLOT  5  ATM_LE           Code:  41
LEC: Transitioning into the ATM_LEC_CONFIGURE state for cct 3

#95: 11/03/95 11:45:14.996 DEBUG     SLOT  5  ATM_LE           Code:  45
LEC: Control pkt ... Config frame received on Control VCC (0/32)

LEC: Received pkt on Config Direct VCC

LEC: Control Packet -

   Opcode:     CONFIG
      Req_Type:   RESPONSE     Status:    SUCCESS
```

```
   Transaction_Id: 00fb7b60   Requestor LECID: 0050   Flags: 0000

   Lan Type:      802.3
    Max Frame Size:       1516

   Lan Name: 29

   Targ ATM Address: 39000000000000000000000000-0800201a42c4/29
  Dest LAN: ----

#96: 11/03/95 11:45:15.000 DEBUG     SLOT  5  ATM_LE           Code:  45
   Src ATM Address:  39000000000000000000000000-0000a20e9fca/00
  Src LAN:  00:00:a2:0e:9f:ca

   Num TLVs: 0

LEC: LEC #3 received Config Response pkt

LEC: Config Resp: LAN name is 29

LEC:     ... Config Resp parsed successfully

************************************************************************
```

The LE client received a response to its Config Request; this response was parsed correctly. The response contains information such as the LAN emulation server address for this LE client. The MIB object *wfAtmLecStatusEntry* contains additional information about the emulated LAN that the ATM address (LE client) will join. The MIB object *wfAtmLecOperConfigEntry* contains information about the operational parameters for this LEC.

```
************************************************************************

#97: 11/03/95 11:45:15.000 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: OPEN VC REQ

#98: 11/03/95 11:45:15.000 TRACE     SLOT  5  ATM_LE           Code:  41
LEC: Called SIG_Open_VC: cct 3 call_ref 7 sig_id 1
LEC: Transitioning into the ATM_LEC_JOIN state for cct 3

#99: 11/03/95 11:45:15.000 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: ATM VC Reserve Response

#100: 11/03/95 11:45:15.003 DEBUG     SLOT  5  ATM_SIG         Code:  24
FSM atmlmst_cing_rr: call_ref=7, State=RESERVE WAIT,
Event=ATM_VC_RESERVE_RSP_MS
ATM Layer Manager Outbound: Connect Request

#101: 11/03/95 11:45:15.949 DEBUG     SLOT  5  ATM_SIG         Code:  24
```

```
ATM Layer Manager Inbound: Signalling Connection Status Indication
#102: 11/03/95 11:45:15.968 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Signalling Connection Confirm
FSM atmlmst_cing_tcc: call_ref=7, State=NETWORK WAIT,
Event=AMUIAMTCONCFM

#103: 11/03/95 11:45:15.972 INFO      SLOT  5  ATM              Code:   8
Line 1405101 : vpi/vci 0/33 has been activated.

#104: 11/03/95 11:45:15.972 INFO      SLOT  5  ATMINTF          Code:  15
Port 1: virtual channel VPI=0/VCI=33 (call reference 7) activated.

#105: 11/03/95 11:45:15.976 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: VC MOD RESPONSE Message
FSM atmlmst_cing_vmr: call_ref=7, State=VC_MOD_MSG WAIT,
Event=VC_MOD_RSP
ATM Layer Manager Outbound: Open Confirm

#106: 11/03/95 11:45:15.976 DEBUG     SLOT  5  ATM_LE           Code:  45
LEC: opened Control Direct VCC for LEC #3 (VP/VC 0/33)

LEC: Control Packet -

   Opcode:       JOIN
      Req_Type:    REQUEST

   Transaction_Id: 00fb7b60   Requestor LECID: 0000   Flags: 0080

   Lan Type:      802.3
    Max Frame Size:       1516

   Lan Name: 29

#107: 11/03/95 11:45:15.980 DEBUG     SLOT  5  ATM_LE           Code:  45
   Targ ATM Address: 000000000000000000000000000-000000000000/00
  Dest LAN: ----

   Src ATM Address:  39000000000000000000000000-0000a20e9fca/00
  Src LAN:  00:00:a2:0e:9f:ca

#108: 11/03/95 11:45:16.050 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Signalling Connection Indication

#109: 11/03/95 11:45:16.054 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Outbound: Connection Status Request
ATM Layer Manager Inbound: ATM VC Reserve Response
FSM atmlmst_ced_rr: call_ref=8, State=RESERVE WAIT,
Event=ATM_VC_RESERVE_RSP_MSG
```

```
#110: 11/03/95 11:45:16.058 INFO     SLOT  5  ATM              Code:   8
Line 1405101 : vpi/vci 0/34 has been activated.

#111: 11/03/95 11:45:16.058 INFO     SLOT  5  ATMINTF          Code:  15
Port 1: virtual channel VPI=0/VCI=34 (call reference 8) activated.

#112: 11/03/95 11:45:16.058 DEBUG    SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: VC MOD RESPONSE Message
FSM atmlmst_ced_vmr: call_ref=8, State=VC_MOD_MSG WAIT, Event=VC_MOD_RSP

#113: 11/03/95 11:45:16.062 DEBUG    SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Outbound: Connect Response

#114: 11/03/95 11:45:16.070 DEBUG    SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Signalling Connection Status Indication
FSM atmlmst_ced_tcsi: call_ref=8, State=NETWORK WAIT,
Event=AMUIAMTCNSTIND
ATM Layer Manager Outbound: Open Indication

#115: 11/03/95 11:45:16.070 DEBUG    SLOT  5  ATM_LE           Code:  45
LEC: Open call indicate (Control VCC) for LEC #3 (VP/VC 0/34)

#116: 11/03/95 11:45:16.070 DEBUG    SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: OPEN VC RESP

#117: 11/03/95 11:45:16.082 DEBUG    SLOT  5  ATM_LE           Code:  45
LEC: Received LE-JOIN Response pkt for LEC #3

LEC: Control Packet -

   Opcode:       JOIN
      Req_Type:   RESPONSE     Status:    SUCCESS

   Transaction_Id: 00fb7b60   Requestor LECID: 0050   Flags: 0080

   Lan Type:      802.3
    Max Frame Size:       1516

   Lan Name: 29

   Targ ATM Address: 39000000000000000000000000-0800201a42c4/01
  Dest LAN: ----
#118: 11/03/95 11:45:16.085 DEBUG    SLOT  5  ATM_LE           Code:  45
   Src ATM Address:  39000000000000000000000000-0000a20e9fca/00
  Src LAN:  00:00:a2:0e:9f:ca
```

```
#119: 11/03/95 11:45:16.085 TRACE     SLOT  5  ATM_LE           Code:  41
LEC: LEC #3 successfully joined LAN 29 (LECID = 0050)
```

****

The LEC has opened a Control Direct VC, transmitted a join request, received an open indication for the Control Distribute VC, and received a join response from the LES of the emulated LAN. The LEC has successfully joined the emulated LAN.

****

```
#120: 11/03/95 11:45:16.085 DEBUG     SLOT  5  ATM_LE           Code:  45
LEC API msg: LE Event Response from LEC #3 UserHandle 15592560  TransId
00000000
      LAN Emulation MAC Service Up Event from LEC #16308

LEC API msg: LE Config Response from LEC #3 UserHandle 15592560  TransId
00edec7

#121: 11/03/95 11:45:16.085 INFO      SLOT  5  ATM_LE           Code:   4
Line 1405101 : Circuit 3 : ATM LEC configuration complete.

#122: 11/03/95 11:45:16.085 DEBUG     SLOT  5  ATM_LE           Code:  45
LEC: Control Packet -

#123: 11/03/95 11:45:16.089 DEBUG     SLOT  5  ATM_LE           Code:  45
   Opcode:        ARP
      Req_Type:    REQUEST

   Transaction_Id: 00000000   Requestor LECID: 0050   Flags: 0000

   Lan Type:      802.3
    Max Frame Size:     Unspec

   Lan Name: -------

   Targ ATM Address: 000000000000000000000000-000000000000/00
  Dest LAN: ff:ff:ff:ff:ff:ff

   Src ATM Address:  39000000000000000000000000-0000a20e9fca/00
  Src LAN:  ----
```

****

The LE client sends an LE ARP request for the BUS using a MAC address that contains all Fs.

****

```
#124: 11/03/95 11:45:16.089 TRACE     SLOT  5  ATM_LE           Code:  41
LEC: Transitioning into the ATM_LEC_BUSCONNECT state for cct 3
```

```
#125: 11/03/95 11:45:16.093 DEBUG     SLOT  5  ATM_LE           Code:  45
LEC: Received one of our LE-ARP Responses back for LEC #3

LEC: Control Packet -

   Opcode:        ARP
      Req_Type:   RESPONSE     Status:    SUCCESS

   Transaction_Id: 00000000   Requestor LECID: 0050   Flags: 0000

   Lan Type:      802.3
    Max Frame Size:     Unspec

   Lan Name: -------

   Targ ATM Address: 39000000000000000000000000-0800201a42c4/a9

#126: 11/03/95 11:45:16.097 DEBUG     SLOT  5  ATM_LE           Code:  45
  Dest LAN: ff:ff:ff:ff:ff:ff

   Src ATM Address:  39000000000000000000000000-0000a20e9fca/00
  Src LAN:  ----

**************************************************************************
```

The LEC has received an LE ARP response and proceeds to open up the multicast send VCC to the BUS.

```
**************************************************************************

#127: 11/03/95 11:45:16.097 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: OPEN VC REQ

#128: 11/03/95 11:45:16.097 TRACE     SLOT  5  ATM_LE           Code:  41
LEC: Called SIG_Open_VC: cct 3 call_ref 9 sig_id 2

#129: 11/03/95 11:45:16.097 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: ATM VC Reserve Response
FSM atmlmst_cing_rr: call_ref=9, State=RESERVE WAIT,
Event=ATM_VC_RESERVE_RSP_MS
ATM Layer Manager Outbound: Connect Request

#130: 11/03/95 11:45:16.949 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Signalling Connection Status Indication

#131: 11/03/95 11:45:16.980 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Signalling Connection Confirm
FSM atmlmst_cing_tcc: call_ref=9, State=NETWORK WAIT,
Event=AMUIAMTCONCFM
```

```
#132: 11/03/95 11:45:16.984 INFO     SLOT  5  ATM             Code:   8
Line 1405101 : vpi/vci 0/35 has been activated.

#133: 11/03/95 11:45:16.984 INFO     SLOT  5  ATMINTF          Code:  15
Port 1: virtual channel VPI=0/VCI=35 (call reference 9) activated.

#134: 11/03/95 11:45:16.984 DEBUG    SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: VC MOD RESPONSE Message
FSM atmlmst_cing_vmr: call_ref=9, State=VC_MOD_MSG WAIT,
Event=VC_MOD_RSP
ATM Layer Manager Outbound: Open Confirm

#135: 11/03/95 11:45:16.984 DEBUG    SLOT  5  ATM_LE           Code:  45
LEC: opened LE-802.3-Mcast VCC (0/35)

#136: 11/03/95 11:45:16.988 DEBUG    SLOT  5  ATM_LE           Code:  45
LEC API msg: LE Resolve Response from LEC #3 UserHandle 15592560  TransId
00edec

#137: 11/03/95 11:45:17.031 DEBUG    SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Signalling Connection Indication
ATM Layer Manager Outbound: Connection Status Request

#138: 11/03/95 11:45:17.035 DEBUG    SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: ATM VC Reserve Response
FSM atmlmst_ced_rr: call_ref=10, State=RESERVE WAIT,
Event=ATM_VC_RESERVE_RSP_MS

#139: 11/03/95 11:45:17.035 INFO     SLOT  5  ATM             Code:   8
Line 1405101 : vpi/vci 0/36 has been activated.

#140: 11/03/95 11:45:17.039 INFO     SLOT  5  ATMINTF          Code:  15
Port 1: virtual channel VPI=0/VCI=36 (call reference 10) activated.

#141: 11/03/95 11:45:17.039 DEBUG    SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: VC MOD RESPONSE Message
FSM atmlmst_ced_vmr: call_ref=10, State=VC_MOD_MSG WAIT,
Event=VC_MOD_RSP
ATM Layer Manager Outbound: Connect Response

#142: 11/03/95 11:45:17.046 DEBUG    SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Signalling Connection Status Indication

#143: 11/03/95 11:45:17.050 DEBUG    SLOT  5  ATM_SIG          Code:  24
FSM atmlmst_ced_tcsi: call_ref=10, State=NETWORK WAIT,
Event=AMUIAMTCNSTIND
ATM Layer Manager Outbound: Open Indication
```

```
#144: 11/03/95 11:45:17.050 DEBUG     SLOT  5  ATM_LE           Code:  45
LEC: Multicast Fwd open call indicate for LEC #3 (VP/VC 0/36)

**************************************************************************
```

The LEC has received an open indication for the multicast forward VC and can now inform upper-layer applications that its services are available.

```
**************************************************************************

LEC API msg: LE Event Response from LEC #3 UserHandle 15592560  TransId
00000000
      Rx VCC Added Event from LEC #16308
: VCC (0/36)

#145: 11/03/95 11:45:17.050 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: OPEN VC RESP

#146: 11/03/95 11:45:17.132 TRACE     SLOT  5  ATM_LE           Code:  41
LEC: Calling SIG_Bind(LE_8023_DATA): cct 3 bind_id 1

#147: 11/03/95 11:45:17.132 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Bind Request
ATM Layer Manager Outbound: Bind Request
ATM Layer Manager Outbound: Bind Confirm

#148: 11/03/95 11:45:17.136 TRACE     SLOT  5  ATM_LE           Code:  41
LEC: Transitioning into the ATM_LEC_OPERATIONAL state for cct 3
Line 1405101 : Circuit 3 : ATM LEC Data SAP binding complete.
LEC: Calling SIG_Register(CPN): cct 3 bind_id 1 sig_id 3 reg_id 4

#149: 11/03/95 11:45:17.136 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Register Request
ATM Layer Manager Outbound: Register Confirm

#150: 11/03/95 11:45:17.140 TRACE     SLOT  5  ATM_LE           Code:  41
LEC: Calling SIG_Register(BLLI): cct 3 bind_id 1 sig_id 3 reg_id 5

#151: 11/03/95 11:45:17.148 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Register Request

#152: 11/03/95 11:45:17.152 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Outbound: Register Confirm

#153: 11/03/95 11:45:17.160 TRACE     SLOT  5  ATM_LE           Code:  37
Line 1405101 : Circuit 3 : ATM LEC Data SAP register confirm for
reg_id 4.
Line 1405101 : Circuit 3 : ATM LEC Data SAP register confirm for
reg_id 5.
```

```
#154: 11/03/95 11:45:17.175 DEBUG     SLOT  5  ATM_LE           Code:  45
LEC: Control Packet -

   Opcode:        ARP
      Req_Type:    REQUEST

   Transaction_Id: 00000001   Requestor LECID: 0050   Flags: 0000

   Lan Type:      802.3

#155: 11/03/95 11:45:17.179 DEBUG     SLOT  5  ATM_LE           Code:  45
    Max Frame Size:     Unspec

   Lan Name: -------

   Targ ATM Address: 000000000000000000000000-000000000000/00
  Dest LAN: 00:00:a2:0d:72:e2

   Src ATM Address:  390000000000000000000000-0000a20e9fca/00
  Src LAN:  ----
*************************************************************************
The LEC has sent an LE ARP request out for MAC address 00:00:a2:0d:72:e2.
*************************************************************************

#156: 11/03/95 11:45:17.187 DEBUG     SLOT  5  ATM_LE           Code:  45
LEC: Received LE-ARP Request pkt for LEC #3

LEC: Control Packet -

   Opcode:        ARP
      Req_Type:    REQUEST


   Transaction_Id: 00000001   Requestor LECID: 0050   Flags: 0000

   Lan Type:      802.3
    Max Frame Size:     Unspec

   Lan Name: -------

   Targ ATM Address: 000000000000000000000000-000000000000/00
  Dest LAN: 00:00:a2:0d:72:e2

   Src ATM Address:  390000000000000000000000-0000a20e9fca/00
```

```
#157: 11/03/95 11:45:17.191 DEBUG     SLOT  5  ATM_LE           Code:  45
  Src LAN:  ----

     ... not for us (LEC #3)

LEC: Received one of our LE-ARP Responses back for LEC #3

**************************************************************************
```

The LES has sent the LE client a copy of the LE ARP request. The LE client drops this request because it recognizes it as its own.

The LE client receives the copy of this request from the LES because the address for which it is sending an ARP request is currently not registered with the switch. Under these circumstances, the LES forwards the ARP request to all clients that have successfully joined the emulated LAN as proxy agents.

```
**************************************************************************

LEC: Control Packet -

#158: 11/03/95 11:45:17.195 DEBUG     SLOT  5  ATM_LE           Code:  45
   Opcode:        ARP
      Req_Type:   RESPONSE     Status:    SUCCESS

   Transaction_Id: 00000001   Requestor LECID: 0050   Flags: 0000

   Lan Type:      802.3
    Max Frame Size:     Unspec

   Lan Name: -------

   Targ ATM Address: 39000000000000000000000000-0000a20d72e2/00
  Dest LAN: 00:00:a2:0d:72:e2



   Src ATM Address:  39000000000000000000000000-0000a20e9fca/00
  Src LAN:  ----

**************************************************************************
```

The LE client has received an LE ARP response for the previous LE ARP request which it sent out. The LEC now knows to associate MAC address 00:00:a2:0d:72:e2 with ATM address 39000000000000000000000000-0000a20d72e2/00. The LE client now tries to open up a Data VC to the remote LEC.

```
**************************************************************************

#159: 11/03/95 11:45:17.195 DEBUG     SLOT  5  ATM_SIG           Code:  24
```

```
ATM Layer Manager Inbound: OPEN VC REQ

#160: 11/03/95 11:45:17.199 TRACE     SLOT  5  ATM_LE           Code:  41
LEC: Called SIG_Open_VC: cct 3 call_ref 11 sig_id 3

#161: 11/03/95 11:45:17.199 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: ATM VC Reserve Response
FSM atmlmst_cing_rr: call_ref=11, State=RESERVE WAIT,
Event=ATM_VC_RESERVE_RSP_M
ATM Layer Manager Outbound: Connect Request

#162: 11/03/95 11:45:17.367 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Signalling Connection Indication
ATM Layer Manager Outbound: Connection Status Request

#163: 11/03/95 11:45:17.371 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: ATM VC Reserve Response
FSM atmlmst_ced_rr: call_ref=12, State=RESERVE WAIT,
Event=ATM_VC_RESERVE_RSP_MS

#164: 11/03/95 11:45:17.374 INFO      SLOT  5  ATM              Code:   8
Line 1405101 : vpi/vci 0/37 has been activated.

#165: 11/03/95 11:45:17.374 INFO      SLOT  5  ATMINTF          Code:  15
Port 1: virtual channel VPI=0/VCI=37 (call reference 12) activated.

#166: 11/03/95 11:45:17.374 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: VC MOD RESPONSE Message
FSM atmlmst_ced_vmr: call_ref=12, State=VC_MOD_MSG WAIT,
Event=VC_MOD_RSP
ATM Layer Manager Outbound: Connect Response

#167: 11/03/95 11:45:17.382 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: Signalling Connection Status Indication
FSM atmlmst_ced_tcsi: call_ref=12, State=NETWORK WAIT,
Event=AMUIAMTCNSTIND
ATM Layer Manager Outbound: Open Indication

#168: 11/03/95 11:45:17.382 DEBUG     SLOT  5  ATM_LE           Code:  45
LEC: Data Direct open call indicate for LEC #3 (VP/VC 0/37)

#169: 11/03/95 11:45:17.386 TRACE     SLOT  5  ATM_LE           Code:  41
LEC: Calling SIG_Close_VC: cct 3 call_ref 11 sig_id 3

#170: 11/03/95 11:45:17.386 DEBUG     SLOT  5  ATM_SIG          Code:  24
ATM Layer Manager Inbound: CLOSE VC REQ
FSM atmlmst_cv_nws: call_ref=11, State=NETWORK WAIT, Event=ATM_CLOSE_VC
ATM Release request: call_ref = 11 cid = 13 vpi/vci = 0/0
```

```
#171: 11/03/95 11:45:17.386 WARNING   SLOT  5  ATM_LE          Code:  34
LEC: incoming Data Direct call accepted - call collision drops old
pending VCC
call_ref = 11 for LEC #3

**************************************************************************
While opening up the data VC the LE client noticed that the remote LE client was
also trying to open a data VC.  Since this local LE client ATM address is smaller
than the remote LE client ATM address, the local LE client accepts the incoming
data VC and drops the outgoing data VC.
**************************************************************************

#172: 11/03/95 11:45:17.386 DEBUG     SLOT  5  ATM_LE          Code:  45
LEC API msg: LE Event Response from LEC #3 UserHandle 15592560  TransId
00000000
      Rx VCC Added Event from LEC #16308
: VCC (0/37)

#173: 11/03/95 11:45:17.386 DEBUG     SLOT  5  ATM_SIG         Code:  24
ATM Layer Manager Inbound: ATM VC Release Response
ATM Layer Manager Outbound: Release Request

#174: 11/03/95 11:45:17.390 DEBUG     SLOT  5  ATM_SIG         Code:  24
ATM Layer Manager Inbound: OPEN VC RESP

#175: 11/03/95 11:45:17.390 DEBUG     SLOT  5  ATM_LE          Code:  45
LEC: LE_READY_IND packet on (0/37) discarded

LEC: Control Packet -

   Opcode:      FLUSH
      Req_Type:    REQUEST

   Transaction_Id: 00000007   Requestor LECID: 0048   Flags: 0000

   Lan Type:     Unspec
    Max Frame Size:     Unspec

   Lan Name: -------

   Targ ATM Address: 39000000000000000000000000-0000a20e9fca/00

#176: 11/03/95 11:45:17.394 DEBUG     SLOT  5  ATM_LE          Code:  45
  Dest LAN: ----

   Src ATM Address:  39000000000000000000000000-0000a20d72e2/00
  Src LAN:  ----
```

```
LEC: Replying to received LE-FLUSH-REQUEST for LEC #3

**************************************************************************
```

The remote LE client begins the Flush protocol so that it can begin using the new Data VC.

```
**************************************************************************

LEC: Control Packet -

   Opcode:      FLUSH
      Req_Type:   RESPONSE     Status:    SUCCESS

   Transaction_Id: 00000007   Requestor LECID: 0048   Flags: 0000

   Lan Type:     Unspec
    Max Frame Size:     Unspec

   Lan Name: -------

   Targ ATM Address: 39000000000000000000000000-0000a20e9fca/00
  Dest LAN: ----

   Src ATM Address:  39000000000000000000000000-0000a20d72e2/00
  Src LAN:  ----

**************************************************************************
```

This LE client responds to the flush request since its ATM address matches the Target ATM Address.

```
**************************************************************************

#177: 11/03/95 11:45:18.054 DEBUG     SLOT  5  ATM_LE           Code:  45
LEC: LE-ARP 15592614 second reverification timeout expired for LEC 3

#178: 11/03/95 11:45:18.054 TRACE     SLOT  5  ATM_LE           Code:  41
LEC: LE-ARP reverifying batch of bindings for LEC #3

#179: 11/03/95 11:45:18.054 DEBUG     SLOT  5  ATM_LE            Code:  4
LEC:     .... destination ff:ff:ff:ff:ff:ff

LEC: Control Packet -

   Opcode:        ARP
      Req_Type:    REQUEST

   Transaction_Id: 00000000   Requestor LECID: 0050   Flags: 0000

   Lan Type:      802.3
```

```
     Max Frame Size:     Unspec
    Lan Name: -------

    Targ ATM Address: 000000000000000000000000000-000000000000/00
   Dest LAN: ff:ff:ff:ff:ff:ff

    Src ATM Address:  39000000000000000000000000-0000a20e9fca/00
   Src LAN:  ----

LEC:     .... destination 00:00:a2:0d:72:e2

#180: 11/03/95 11:45:18.058 DEBUG     SLOT  5  ATM_LE           Code:  45
LEC: Control Packet -

    Opcode:        ARP
       Req_Type:    REQUEST

    Transaction_Id: 00000000   Requestor LECID: 0050   Flags: 0000

    Lan Type:      802.3
     Max Frame Size:     Unspec

    Lan Name: -------

    Targ ATM Address: 000000000000000000000000000-000000000000/00
   Dest LAN: 00:00:a2:0d:72:e2

    Src ATM Address:  39000000000000000000000000-0000a20e9fca/00
   Src LAN:  ----

#181: 11/03/95 11:45:18.062 DEBUG     SLOT  5  ATM_LE           Code:  45
LEC: Received LE-ARP Request pkt for LEC #3

LEC: Control Packet -

    Opcode:        ARP
       Req_Type:    REQUEST

    Transaction_Id: 00000000   Requestor LECID: 0050   Flags: 0000

    Lan Type:      802.3
     Max Frame Size:     Unspec

    Lan Name: -------

    Targ ATM Address: 000000000000000000000000000-000000000000/00
   Dest LAN: 00:00:a2:0d:72:e2
```

```
   Src ATM Address:  39000000000000000000000000-0000a20e9fca/00
  Src LAN:  ----

     ... not for us (LEC #3)

LEC: Received one of our LE-ARP Responses back for LEC #3

LEC: Control Packet -

#182: 11/03/95 11:45:18.066 DEBUG     SLOT  5  ATM_LE           Code:  45
   Opcode:        ARP
      Req_Type:   RESPONSE     Status:    SUCCESS

   Transaction_Id: 00000000   Requestor LECID: 0050   Flags: 0000

   Lan Type:      802.3
    Max Frame Size:     Unspec

   Lan Name: -------

   Targ ATM Address: 39000000000000000000000000-0000a20d72e2/00
  Dest LAN: 00:00:a2:0d:72:e2
   Src ATM Address:  39000000000000000000000000-0000a20e9fca/00
  Src LAN:  ----

LEC: got reverification response for dest 00:00:a2:0d:72:e2 on LEC #3

LEC: Received one of our LE-ARP Responses back for LEC #3

LEC: Control Packet -

   Opcode:        ARP
      Req_Type:   RESPONSE     Status:    SUCCESS

#183: 11/03/95 11:45:18.070 DEBUG     SLOT  5  ATM_LE           Code:  45
   Transaction_Id: 00000000   Requestor LECID: 0050   Flags: 0000

   Lan Type:      802.3
    Max Frame Size:     Unspec

   Lan Name: -------

   Targ ATM Address: 39000000000000000000000000-0800201a42c4/a9
  Dest LAN: ff:ff:ff:ff:ff:ff

   Src ATM Address:  39000000000000000000000000-0000a20e9fca/00
  Src LAN:  ----
```

```
LEC: got reverification response for dest ff:ff:ff:ff:ff:ff on LEC #3

**************************************************************************
This LEC completes the verification of its LE ARP cache for MAC addresses
ff:ff:ff:ff:ff:ff and 00:00:a2:0d:72:e2.
**************************************************************************

#184: 11/03/95 11:45:22.054 TRACE     SLOT  5  ATM_LE           Code:  41
LEC: LE-ARP checking timed out reverifies for LEC #3

#185: 11/03/95 11:45:22.406 DEBUG     SLOT  5  ATM_LE           Code:  42
Line 1405101 : Circuit 3 : ATM LEC ARP Table modified for MAC
0x0000a20d72e2.
Old VC (0/35) vcid = 11
New VC (0/0) vcid = 0
Sending FLUSH REQuest for MAC 0x0000a20d72e2 with id 1

**************************************************************************
This LEC sends a flush request and modifies the LE ARP cache so that packets
destined for the MAC address 00:00:a2:0d:72:e2 temporarily drop.
**************************************************************************

LEC: Control Packet -

   Opcode:      FLUSH
      Req_Type:    REQUEST

#186: 11/03/95 11:45:22.410 DEBUG     SLOT  5  ATM_LE           Code:  45
   Transaction_Id: 00000001   Requestor LECID: 0050   Flags: 0000

   Lan Type:     Unspec
    Max Frame Size:     Unspec

   Lan Name: -------

   Targ ATM Address: 39000000000000000000000000-0000a20d72e2/00
  Dest LAN: ----

   Src ATM Address:  39000000000000000000000000-0000a20e9fca/00
  Src LAN:  ----

LEC: Flush packet not for LEC 3 discarded

#187: 11/03/95 11:45:22.414 DEBUG     SLOT  5  ATM_LE           Code:  45
LEC: Control Packet -

   Opcode:      FLUSH
```

```
      Req_Type:   RESPONSE     Status:    SUCCESS

   Transaction_Id: 00000001   Requestor LECID: 0050   Flags: 0000

   Lan Type:     Unspec
    Max Frame Size:     Unspec

   Lan Name: -------

   Targ ATM Address: 39000000000000000000000000-0000a20d72e2/00
  Dest LAN: ----

   Src ATM Address:  39000000000000000000000000-0000a20e9fca/00
  Src LAN:  ----

Received FLUSH RESPonse for MAC 0x0000a20d72e2 with id 1

Line 1405101 : Circuit 3 : ATM LEC ARP Table modified for MAC
0x0000a20d72e2.
Old VC (0/0) vcid = 0
New VC (0/37) vcid = 14

************************************************************************
```

This LEC receives a flush response and modifies the LE ARP cache so that packets destined for the MAC address 00:00:a2:0d:72:e2 use VPI/VCI 0/37.

```
************************************************************************
```

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